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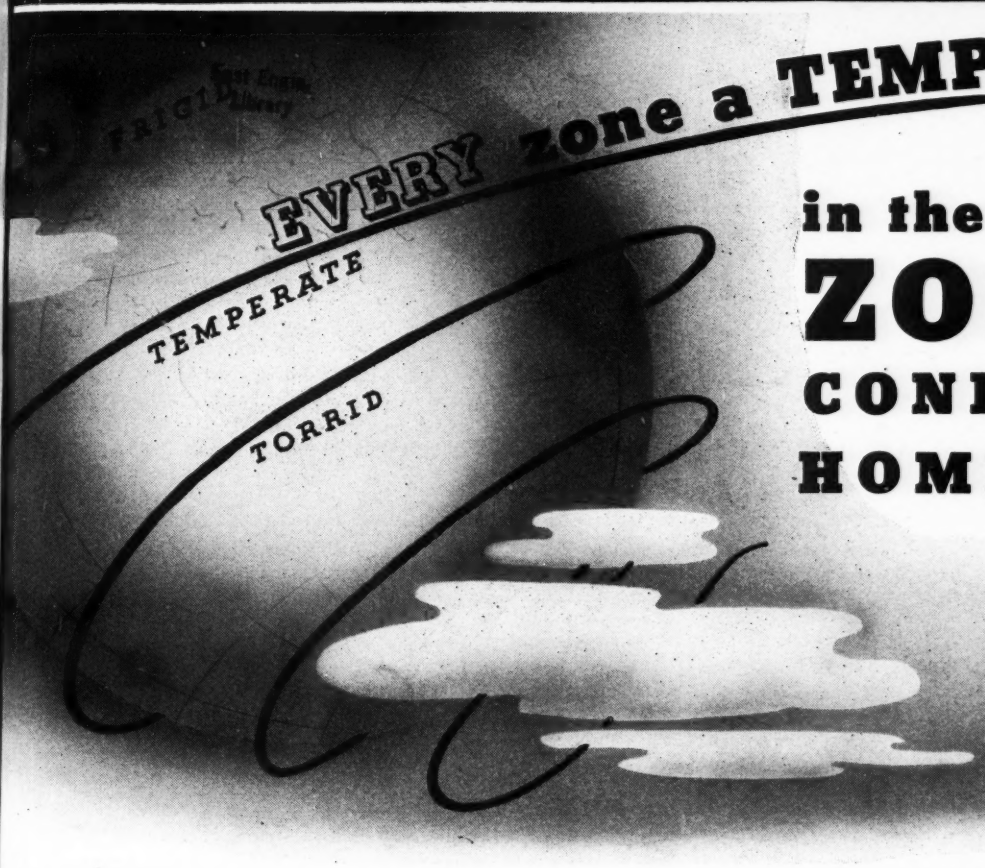

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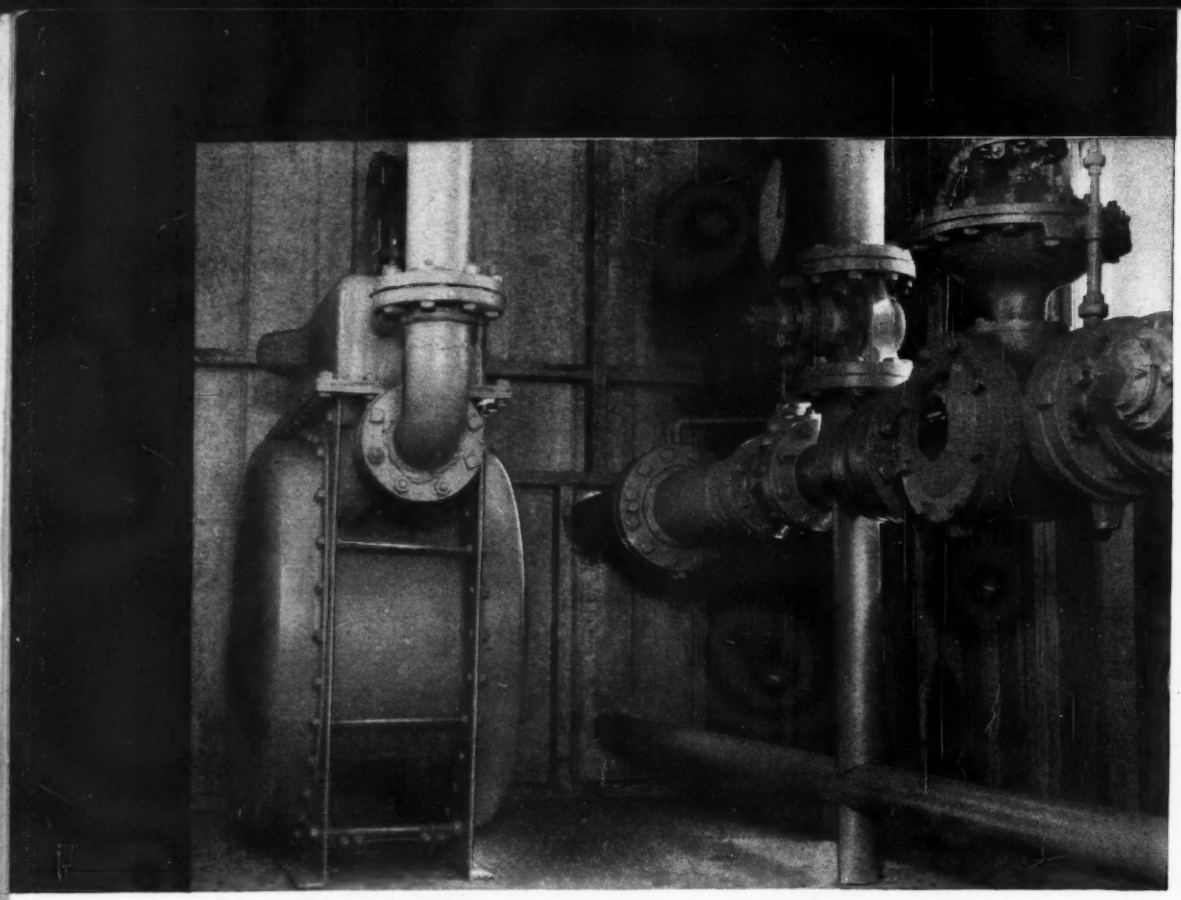

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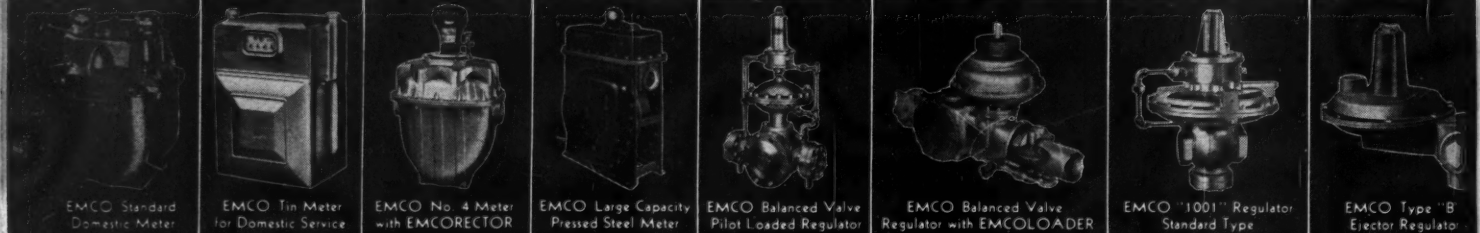

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Twentieth Year of Publication

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GUEST EDITORIAL

BUILDING FOR PERMANENCE

By E. L. PAYNE

President, Payne Furnace & Supply Co., Inc., Beverly Hills, California

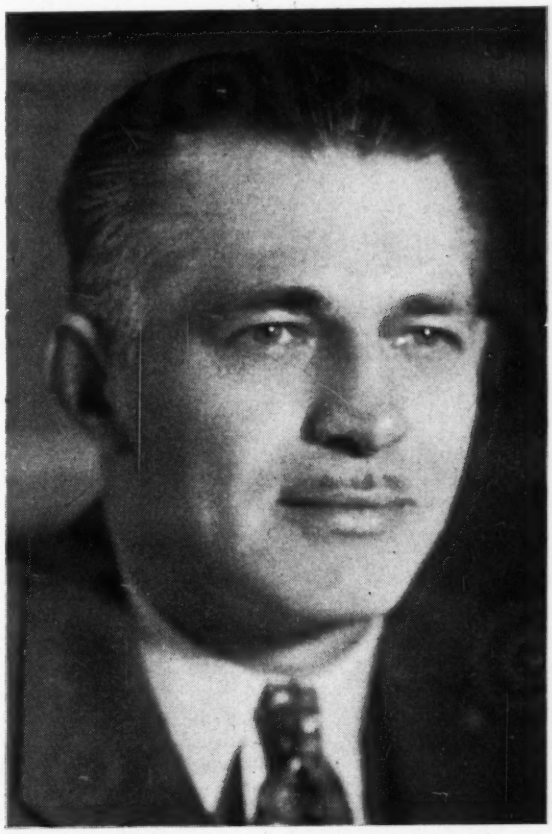
and

President, Pacific Coast Gas Association

REVIEWING the nearly 130 years of modern Gas History we cannot but be proud of its remarkable accomplishments. From its first use as a source of light through the years 1816 to 1915 it found its place as a better fuel for scores of uses—cooking, heating, baking, even a large place in Industry. But it still, after 100 years, found over half its revenue from its lighting load. Hence its quality was judged by its candle power. The 28 years since has seen it enter a thousand fields, and be put to many thousands of new uses, all dependent upon its heating value instead of its candle power. Great strides have been made in holding this heating value within close limits in individual plants. What of the future?

The British thermal unit is now our universal standard. American Standards Association requirements are setting goals of ever higher efficiencies. These make it imperative that in the future we make intensive research, looking to discovering by what methods gas can be produced most economically; at what heating values, pressures and specific gravities it will render most efficient service; and how to assure its quality will be such as to effect the minimum of service and reduce or eliminate costly appliance gadgets, the only useful service of which is to overcome conditions arising from gases of improper quality.

Obviously the utilities cannot correct all variables overnight, but it is highly imperative that planning be done to assure reaching the goal of clean gas, delivered at uniform pressure and of uniform quality. It is equally important that every effort be made to attain this goal on as nearly as possible a national basis, and surely on a regional basis. Appliance and equipment manufacturers are doing everything they can to create gas burning equipment capable of maximum service, at ever lower comparable costs, and we urgently need this uniformity, even pressures, constant heat values and specific gravities, and purity of the gas, not only on each utility's lines, but, as far as research can accomplish it, nation-wide.



Firm believers in the permanence of gas as a servant whose capacity for usefulness is ever increasing, we must not rest on past accomplishments, but with renewed vigor explore with all the scientific means at our command every avenue which may lead to more nearly perfect service. Studies such as have been made by the American Gas Association Testing Laboratories looking to methods of mixing gases of various types to offset declining supplies of natural gases in certain sections, and to augment both manufactured and natural gases in areas where wartime demands created great peak loads, must be continued and expanded. Research now under way by the Institute of Gas Technology must be further augmented to the end that gas continue its forward march in usefulness to mankind. By-product recovery proven so helpful and profitable by our own Pacific Coast company in Portland, must become universal, not sporadic as now, not alone because we must conserve those recoverable materials, sources of the real wealth of our nation, but because their presence in mains and services increases maintenance expenses, results in poorer customer satisfaction, prevents proper rates and causes higher appliance manufacturing, warehousing and distribution costs.

An industry with a record as magnificent as ours has been, overcoming so many seemingly insurmountable obstacles, maintaining uninterrupted service to home and industry for nearly one and a half centuries, surely will meet the challenge confronting it and so program its future activities that maximum production economies will result, clean gas be served at uniform pressures, gravities and heating values, thus extending much needed assistance to its affiliated appliance manufacturers, application of whose inventive ability is now, in large measure, circumscribed by fuel variables over which they have no control.

Let's place first in our Postwar Plans those research items which benefit the customer most, and surely the research which will lower fuel costs, appliance costs and service costs must benefit user, utility and manufacturer. We are about to enter an era of selling more highly competitive than we have ever known, and our Industry has never failed to win its rightful share. We know the problem, we know our product, we have access to the research ability, we must not fail.

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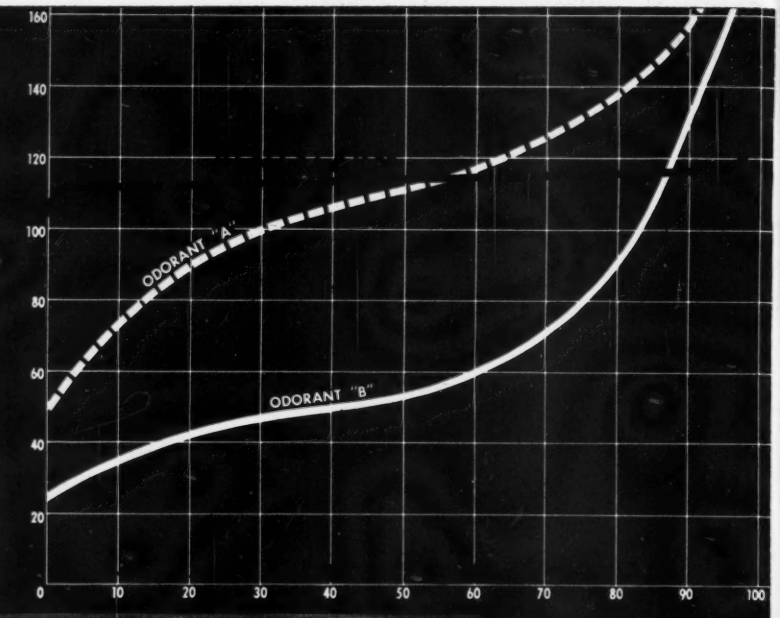
UNIFORMITY *and* HIGH QUALITY



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Thermally Thinking

By ELLIOTT TAYLOR, Washington Editor

Intervention

THE new Independent Natural Gas Association of America has been granted permission to intervene before the Federal Power Commission in the matter of a rehearing on the Memphis Natural Gas Company's petition to increase slightly the capacity of its existing pipeline system. This was the application which the FPC denied early in June on the grounds that the reserves of the company should be conserved for "domestic, commercial and superior industrial uses"; and the association is taking up the case on the grounds that the FPC has no authority under the Natural Gas Act to have anything to say about the desirability of the uses to which gas is to be put.

The FPC, as a matter of fact, isn't any too sure of its own ground in the matter, but with the strong and enthusiastic backing of the coal and railroad intervenors who opposed the Memphis company's application, they just decided to take a long chance. The tireless campaign of the railroad, coal, labor union and other assorted anti-gas interests thus appears to be working wonders for those who have subsidized it, and it is indeed gratifying to see someone with gas industry association standing, finally rising to oppose the FPC in its grab for jurisdiction over every phase of gas operation.

For our money, the Independent Association seems away to a good start. It may not make a conspicuous dent in the united front of allies in opposition to gas, in this its first appearance before a regulatory body; it may make plenty of mistakes in policy and tactics. But at least it will supply official Washington with evidence that an aggressive and active presentation of the natural gas viewpoint may henceforth be expected.

G. E. of Gas

OCCASIONALLY we hear utility vice presidents and sales managers sigh deeply and exhale the profound conviction that what the gas industry needs is one big manufacturer of gas appliances who could pour millions into advertising gas burning equipment, "the way General Electric does in the electrical industry."

Well, a gas appliance manufacturer told us that what the gas appliance industry needs is a few more gas utilities who will support the makers of gas appliances who do advertise—even if it isn't up to G. E. in volume—and who will give them the preference, all other things being equal, because they carry their share of the industry's promotion.

General Electric companies don't suddenly spring into being because someone gets up at a convention and says there ought to be one. They develop and expand and become great because they are supported by an industry that thinks in promotional terms.

Given the same sort of utility and industry support for his output, and given also the opportunity to include in the pricing of that product the money that is necessary to carry on aggressive advertising and promotion, and the gas appliance manufacturers take no back seat to the makers of electrical equipment.

But industry approval of initiative and aggressiveness on the part of a manufacturer must make itself apparent in the form of tangible orders for the merchandise in question. Too often manufacturers have seen their promotion plans applauded by utility executives, only to have the orders handed to small time local competitors who would scoff at the suggestion that they engage in any promotional activities for the good of the industry.

This then, is the crux of the difference in viewpoint between the gas appliance and the electrical appliance manufacturer. It is a condition the remedy of which lies not with industry committees, but with the new business, commercial or sales departments of the merchandising gas utilities.

Or at least, that is what a gas appliance manufacturer told us.

Accomplishment

A VERY successful gas appliance dealer (that is, successful when there are some gas appliances to deal in) recently observed that in his experience the "foreign labor class" which is a sizable population group in his territory is in normal times the most prolific source of high quality gas range sales.

"This class," our informant observed, "gets its greatest pleasure from cooking. With them family life centers in the kitchen. The result is that the equipment that they aspire to own can't be too good for them, and they pay the prices asked."

We sometimes are almost of the opinion that the gas industry is in truth just a little ashamed of the practical application of the fuel that it serves the homes of America. It has tried to promote the impression that it enters as just another servant in homes where servants already are abundant. Yet appliance dealers know that it is to homes without servants that the great bulk of quality appliances are sold. It seems to us that there is an honest recognition of the facts of life in the statement of the dealer who realizes that the "foreign labor class" are among his best prospects for high quality gas ranges because family life centers in the kitchen.

It is gratifying to us to observe that the current advertising of the industry leans increasingly toward the theme of accomplishment in the home. And we venture to predict that as a result, in the renaissance of homemaking that will follow the approaching end of the war, gas will reap the rewards that it deserves as a major exponent of the art of domestic accomplishment.

CP Juniors

AN idea that keeps bobbing to the surface lately in discussions of plans for the postwar merchandising of gas appliances is that stove manufacturers should be prevailed upon to add a few cut price models to the CP range line under the euphemistic designation of CP Juniors. A CP model for every pocketbook seems to be the tentative slogan of the new notion.

We have no objection to the gas appliance manufac-

turers labelling everything that they manufacture as CP if they are so minded, but the manufacturers don't need us to remind them that such labelling would instantly reduce the CP label to a place where it would be meaningless, and as the symbol of an industry promotion completely and utterly ineffective.

The gas industry already has one common denominator in the approval seal of the AGA laboratories, and it is highly improbable that the manufacturers' group wants or needs another. And as far as the utilities are concerned, the addition of a complete CP line embracing many, or for that matter all, models now considered below CP standards would not be of any material assistance to them in their own merchandising programs.

The original CP campaign was one of the best co-operative promotions built around high standards of quality that the gas appliance industry has ever enjoyed. Whether or not it has possibilities of a full scale revival after the war is a matter that we feel can be left to the good judgment of the range manufacturers who were able to envision its promotional possibilities in the first place. Their present stepped-up budget and the current Business Building Plan Kit that is being offered to the industry may supply the answer to the question of CP's future usefulness.

Just as the CP campaign taught the gas consuming public a lot about quality merchandise, it also taught the gas industry a lot about merchandising quality. So it is a safe assumption that postwar merchandising plans for gas ranges will either include a revised and accelerated CP plan, or some other plan, bigger and better.

Superficially, any utility sales manager can point out a few of the advantages the industry gained from the CP range promotion: The average price per appliance sold was materially raised, giving a better margin of profit to retail outlets and making the handling of gas equipment a more attractive proposition to the dealer; great consumer acceptance for gas cooking was built up; the story of almost automatic gas cooking arose to challenge the claims in this respect of the electrical competition; and the selling of gas ranges which had rapidly drifted toward a price appeal proposition was in a measure reestablished on the sounder and more profitable ground of performance.

Another great advantage that the gas range manufacturers enjoyed from their CP promotion was one that could not be paraded before the public. It was the advantage of being able to sell enough glamour to allow of the inclusion of adequate promotional margins in the pricing of the product. Everyone knows that the public, the ultimate consumer, pays the cost of all successful promotion. Even the buying public knows it, yet for some strange reason there is always evidenced great indignation on all sides when the simple truth is so stated.

Rob CP (or any other promotional campaign built on some form of quality, glamour or even snob appeal) of the aura of exclusiveness that is carefully built into its appeal, and you cancel out its greatest single asset. With that asset gone the activity must inevitably fall back on the price appeal as the "do it now" argument to close sales.

We are completely in accord with anyone who has a conviction that every gas range offered for sale should be the best gas range that can be built and sold for the money. We will glory in the day when every piece of gas cooking apparatus will have features that make the CP of today as old fashioned as a bustle.

But until that happy day we do not believe that the merchandising outlook of the gas utilities can always be limited to a search for cheaper appliances, when at the same time the utilities expect and demand that the appliance manufacturer carry his share of the promotional load for gas utilization. It is only common sense to recognize that promotion money for gas appliances must come from, and be included in, the pricing of those appliances by the manufacturer.

CP has made possible the inclusion of some items of promotion expense in the pricing of the ranges thus labeled. Until such time as the manufacturers themselves decide that it has outlived its usefulness as presently set up, we do not believe it advisable for well meaning outsiders to tamper with its effective mechanism.

This Month . . . .

DESPITE OPPOSITION in some government circles, it would appear that the natural gas industry is about to enter into an era of great expansion. Soon the Tennessee Gas and Transmission Co. line will be in operation. There is very serious talk of a long distance line from Kansas to California. Natural Gas is pushing its way toward Wisconsin. Perhaps the Big and Little Inch War Emergency lines will be converted to gas carriers. All this means gas transmission line construction and operation. That is why we feel that our lead article this month, "Trends in Gas Transmission Practice" (Page 15), by Loring E. Heckman of PAW is particularly significant. Mr. Heckman has traced the development of pipeline construction from 1926 down to date, showing the trend toward reduced costs through the selection of materials, methods of construction, and operating pressures.

• The future of the gas industry, at least in large measure, may well depend on the Institute of Gas Technology. While certain phases of the Institute's activities have been restricted by the war, it can be seen from the article by Director Yellott (Page 24) that the Institute's basic research program is expanding; that its physical facilities are being improved and enlarged; that with the appointment of Leon Willien as associate director, the staff of men with a practical knowledge of industry problems is growing.

• We would like to call to the attention of field operators an article by C. H. Hinton of Panhandle Eastern Pipe Line Co. on rotary compressors (Page 35). The section on Pipe Coatings in the corrosion series which has been a feature of *GAS* for the past several months is concluded in this issue (Page 51), with articles by D. H. Hiskey of Dearborn Chemical and Walter F. Rogers of Gulf Oil.

And Next

AS IS THE usual practice we intended to publish a lot more in the September issue, but we ran out of pages.

• A notable omission from September (it's planned for October) is the highly technical work of Robert Dunkle of Pacific Gas and Electric Co. on the deviation of natural gas from Boyle's law. This study of the pseudo-critical method of evaluating superexpansibility factors for natural gas was undertaken in connection with tests to extend the range of experimental deviation factors at Rio Vista gas field from 5000 to 1000 psi. pressure.

• For the industrial engineer we have compiled a series on radiant heating. Part of the series, based on experience in England, brings out some advantages of radiant as against convectional heating; another section describes an installation at Hayes Mfg. Co., Grand Rapids; another, equipment developed by Gas Light and Coke Co. of London.

• Still another series we expect to publish next month is one on the use of liquefied petroleum gases by utilities. K. B. Anderson of Coast Counties Gas Co. has prepared two of these—one on standby units, the other on operation of isolated systems. The series is rounded out by John Campbell, a Canadian, who tells how LP-Gases helped his company over the hump in meeting peak load demands.

• The New England Gas Association's Appliance Study Committee has just issued Report No. 2. Part of this report is devoted to suggested improvements in commercial appliances. This is on tap for October.

• E. G. Hammerschmidt of Texoma Natural Gas Co. has long been recognized for his work with natural gas dehydration. He has prepared a brief history of a plant erected at Fritch, Texas, which was designed to dry 80 million cu. ft. of gas per day at an operating pressure of 740 psi.

TRENDS IN GAS TRANSMISSION PRACTICE

By LORING E. HECKMAN

Fuel Supply Consultant, Natural Gas and Natural Gasoline Division
Petroleum Administration for War

Forbes pressure welding machine used on 360 miles of 24-in. Tennessee Gas and Transmission Co. line.

OVER 83% of the known available natural gas reserves in the United States are concentrated in an area consisting of the states of Louisiana and Texas and seven counties in Western Kansas and Oklahoma. Long pipe lines transport gas produced in this area to such distant centers as Denver, Minneapolis, St. Paul, Kansas City, St. Louis, Chicago, Detroit, Memphis, Birmingham and Atlanta. The growth of natural gas consumption in most of these centers is taxing the capacity of existing lines to the limit, with the result that further looping of these lines is expected in the near future.

A large portion of the natural gas consumption of areas such as the Appalachian Area, the Eastern Kansas-Oklahoma Area, and the California Area has been supplied by local production. However, as a result of very high demands upon these local sources during the last four years, there has been a rapid decline in reserves and deliverability, and there is now a need for new transmission lines to carry gas from concentrated supply areas to these established markets to compensate for declining local pro-production.

In view of the necessity for additional natural gas transmission lines in the near future, the practice in design and construction of the lines which have been built recently, or are in the process of construction, should be examined to emphasize those factors which tend to minimize the cost of transmission.

General Considerations

In the design of a gas transmission line, the selection of the size of pipe, the number of compressor stations and the ratio of compression are determined by equations of gas flow and factors of cost along established principles which have been amply discussed in the literature of the gas industry. It is in the selection of materials and of operating pressure that modern practice indicates trends to lower cost.

Certain phases of gas transmission line practice have undergone a change as a result of improvements in pipe welding, in pipe manufacture, in pipe coating and cathodic protection methods, in high pressure valve manufacture, in engine-compressor units and in the technology with reference to super-compressibility and pipeline friction factors. While some of the modern types of material have been available for a considerable time, it has taken the test of time and use to prove the material and its application. Take the case of high-grade electric weld and seamless pipe. This material has been available since about 1931. Yet, until recently, it was not thought practical to employ pressures which would stress the pipe to 70% of yield strength, which is equivalent to a safety factor of 1.4 to 1.5. The apparent delay in the full use of new methods and materials is due largely to the fact that 1931 marked the completion of a great expansion of natural gas lines and no large transmission lines have been built until recently, with the exception of the looping programs of existing lines. In some cases, thinner walled pipe was used than had been installed on the lines which were being looped, but the operating pressures were limited by the original lines.

The tendency at the present time is to employ working pressures of from 700 to 800 psi on long lines and higher pressures on short lines where field compression is not necessary, to determine safety factors on the basis of the yield strength of the steel rather than the ultimate tensile strength, to install angle type engine-compressor units, to dehydrate gas before it enters the line and to estab-

lish a high sustained load.

In 1891, two parallel 8-in. gas lines were constructed into Chicago from Greenstown, a distance of 120 miles, using wrought iron pipe with screw joints. The maximum operating pressure was 525 psi,[1] which was very unusual at that time. In 1909, the Cincinnati Gas Transportation Co. constructed a 20-in. "soft" steel line about 126 miles long from Kenova, W. Va., to Cincinnati, Ohio, using couplings. This line had a maximum operating pressure of 325 psi. Many other lines of similar length and capacity were constructed up to 1926, most all of them being limited to about 300 psi maximum working pressure, some using wrought iron pipe, but many with lap welded steel pipe of about 45,000 psi tensile strength.

The construction of the Interstate Natural Gas Company's 170-mile 22-in. steel pipeline from Monroe Field to Baton Rouge, Louisiana in 1926 and its 90-mile extension of 18-in. in 1927 marked the start of the enormous expansion of long gas lines which took place up until the end of 1931. The Pacific Gas & Electric Co.'s 16 to 22-in. line from Buttonwillow to Milpitas, Calif., completed in 1929, was the first large gas line of all welded construction. The Standard Oil-Pacific Gas transmission line from Buttonwillow to Oakland, Calif, was the first major long natural gas line to use 26-in. pipe.

Table 1 shows sixteen natural gas transmission lines constructed from 1926 to date. While some 40 transmission line projects have been considered in reference to this subject, those listed have been chosen in general because they are major projects or are significant of the trend of transmission line practice. The transmission lines of the Cities Service Gas Co. from Pampa to Wichita, the Colorado Interstate Gas Co. from Texas to Denver, the Columbia Gas & Electric Corp. from Boldman, Ky. to Coatesville, Pa., the Montana Power Co. from Cut Bank to Anaconda and Butte, Mont. and the Southern Natural Gas Co., from Monroe Field to Atlanta, Ga., have been omitted from the table because of lack of full information on the wall thickness of the pipe and the characteristics of the steel. Several of these lines undoubtedly mark the most difficult pipeline work undertaken and they are distinct achievements in design and construction. These lines are from 200 to 450 miles long and consist mostly of 20-in. and 22-in. pipe with maximum working pressures which do not exceed 500 psi and safety factors of 4 to 5 on the ultimate tensile strength. Thus it can be seen that these lines have similar characteristics to those listed on the Table.

[1] "The Long Distance Transmission of Gas," H. C. Cooper, presented at World Fuel Conference held in London, England, 1928.

Working Pressure

The maximum working pressure cannot actually be considered as independent of the safety factor. With a given line size, pipe wall thickness and yield strength, the safety factor decreases with the increase in maximum working pressure. The principal point to be emphasized is that operators now have sufficient confidence in material standards and construction work to be willing to operate lines at maximum working pressures which will stress the steel in the pipe to about 70% of the yield strength, or in other words, to use a safety factor of 1.4 to 1.5.

The conditions which influence the determination of the maximum working pressure should be considered. The selection of the maximum working pressure employed in a gas transmission line is largely dependent upon the engineering judgment of those responsible for the operation and is a question of how much reliability should be placed on materials and construction methods.

The maximum working pressure on most major natural gas transmission lines constructed in the period from 1926 to 1931 was limited to about 500 psi as shown in Table 1. The outstanding exception to this was the 24-in line of the Natural Gas Pipe Line Co. of America from the Panhandle Field in Texas to Chicago, which was operated at 600 psi initially and now operates at a maximum pressure of 712 psi.

During this period, experience gained in the manufacture of large electric weld and seamless pipe and in the construction and operation of hundreds of miles of gas lines under widely varying conditions, brought about improvements in design, in construction and in testing procedure. Lap weld pipe began to be displaced with electric weld and seamless pipe. The use of couplings for all pipe joints was being replaced by composite weld and coupled lines and in some cases by all-welded lines. The technique of acetylene welding was introduced and improved. Similarly, arc welding was introduced and improved. Valves of suitable sizes which have been limited to about 500 psi working pressure were modified and the working pressures increased. Leakage, which was a major problem on screw lines of an earlier day, was reduced to lesser importance in coupled lines by the use of improved coupling gaskets and was largely eliminated in all-welded lines.

As a result of this development, a change in construction practice began to be evident as illustrated by the 800 psi and 650 psi working pressures of the El Paso Natural Gas Co.'s extensions to Bisbee and Douglas and to Phoenix, constructed in 1931 and 1933, and the Zionsville to Detroit extension of the Panhandle Eastern Pipe Line in 1936 having a 600 psi working pressure. In 1936, the Hope Natural Gas Co. completed a 12-¾-in. line 93 miles long in West Virginia, from Cornwall Compressor Station to Hastings Station, designed to operate at 1300 psi. The use of such a high working pressure is a land mark.

In 1941, the United Gas Pipe Line Co. built a 200-mile line from the Lirette Field to Mobile, Ala., with a maximum working pressure of 1000 psi,[2] since high pressure gas was available at this field.

In 1942, the Southern Natural Gas Co. and the Oklahoma Natural Gas Co., each built solid welded lines from high pressure gas fields with 1200 and 1000 psi working pressure respectively. The Southern Counties Gas Co. is now building a line in California between the La Goleta Storage Field and Los Angeles, of which 36 miles will have a maximum working pressure of 1000 psi. These lines illustrate that working pressures of 1000 to 1200 psi are feasible with the present method of construction, and practical where such pressures are available without compression. This is particularly significant in relation to the 22 trillion cu. ft. reserve[3] of

L. E. Heckman

L. E. HECKMAN, since December 1, 1942, has been connected with the Natural Gas and Natural Gasoline Division of the Petroleum Administration for War, first as Senior Analyst then as Fuel Supply Consultant. Prior to that time, from 1928 to 1942, he served Columbia Gas and Electric Corp. and its subsidiaries as gas engineer, his experience including compressor station design and construction, transmission line design and development, appraisals and continuing property record studies, and a natural gas market survey. He is a four-year graduate in Mechanical Engineering (1926), of Rensselaer Polytechnic Institute of Troy, New York.

[2] "Constructing the Lirette-Mobile Line," W. B. Poor, Mech. Eng. 65-9-13 Jan. '43.

[3] "Natural Gas Cycling and Its Significance to the Natural Gas Industry," Robt. W. Ducker and Frank H. Dotterweich, presented to the Natural Gas Section, American Gas Association, French Lick, Indiana. May 11, 1944. GAS, June, 1944. (p. 26.)

TABLE 1. NATURAL GAS TRANSMISSION LINE CHARACTERISTICS. (1926 to 1944)

Company	Date	Pipe Diameter (inches)	Length of Line-Miles	Pipe Wall Thickness (inches)	Max. Working Pressure psi	Safety Factor
						Ultimate
Interstate Natural Gas	1926	22	172	3/8	350	4 to 5
Memphis Natural Gas	1928	18	210	5/16, 11/32	400	4 to 5
Pacitic Gas & Electric	1929	16, 20, 22	297	1/4, 5/16, 9/32	400	4 to 5
Mississippi River Fuel	1929	22	431	5/16, 11/32, 3/8	400	4 to 5
Standard Oil—Pacific Gas (a)	1930	20 to 26	198	3/8, 5/16	400	4 to 5
Panhandle Eastern Pipe Line	1931	20, 22, 24	860	5/16, 11/32	500	4 to 5
Northern Natural Gas	1931	16 to 26	820		400-450	4 to 5 (b)
Natural Gas Pipe Line	1931	24	1000	5/16, 11/32	600 (c)	3. (d)
Hope Natural Gas	1936	12-3/4	93	5/16, 3/8	1300	3.
						Yield Point
Northern Natural Gas	1939	16	243	1/4	600	2.2
Natural Gas Pipe Line	1941	26	400	1/4	712	1.5
Southern Natural Gas	1942	14	120	5/16	1200	1.8
Oklahoma Natural Gas	1942	12-3/4	96	.259, 9/32, 5/16	1000	2.2
New York State Natural Gas	1944	12-3/4	145	9/32, 5/16	1000	2.2
Tennessee Gas & Transmission	1944	24	1200	1/4, 9/32	750	1.4
Cities Service Trans. & Chem.	1944	26	240	1/4	760	1.4

(a) Now an oil line. (b) The safety factor of several sections is not known. (c) "Transportation of Natural Gas from Texas to Chicago." W. Soc. of E. J. 40:54-58 Ap. '35. (d) Based on an assumed T. S. of 80,000 psi and 5/16 in. pipe.

The safety factors listed have been calculated on Barlow's formula using the pipe wall thickness for the section or sections having the maximum working pressures. The figures 4 to 5 have been used because available data is not sufficiently accurate to warrant a closer figure. The company names listed are the present owners of the lines and not necessarily the original builders.

the condensate fields located in Texas and Louisiana, where the rock pressure is very high. While the pressures at which this gas will be available to gas pipelines will vary and cannot be stated exactly, pressures in excess of 1000 psi will be generally available.

The selection of the maximum working pressure of a natural gas transmission line is partially dependent upon the field pressure and the length of the line. If sufficiently high field pressure exists to transmit a suitable volume of gas from a field through a pipeline to the market, without recompression, then this field pressure may well be the most economic maximum working pressure. If, however, the terminal point of the line is many hundreds of miles from the field and numerous recompressions are necessary, then it may not be economically sound to build the entire line for a high maximum working pressure.

The trend of modern practice is illustrated by three major natural gas transmission lines, one built, one building and one which was planned but not built, designed for working pressures from 700 to 800 psi. These are the Cities Service Transmission and Chemical Co.'s 26-in. line from the Hugoton Field with an operating signed to operate at 760 psi working pressure; the Tennessee Gas and Transmission Co.'s 24-in. line from Texas to West Virginia with 750 psi maximum working pressures, and the line which the Hope Natural Gas Co. had contemplated building from the Hugoton Field with an operating pressure of 770 psi. These lines indicate the present practice of long natural gas transmission to use large diameter, thin-walled, high strength pipe with a maximum working pressure of from 700 to 800 psi.

Safety Factor

A glance at Table 1 indicates that up to 1931, most pipelines were designed with a safety factor of from 4 to 5 based upon the ultimate tensile strength of the pipe wall material. Up to about 1927, only butt weld and lap weld pipe were available. The lap welded pipe had a tensile strength of about 45,000 psi, with lap weld joint efficiency of about 92%. The first electric weld pipe was made in 1927. To meet this competition, other pipe companies undertook the manufacture of seamless pipe.

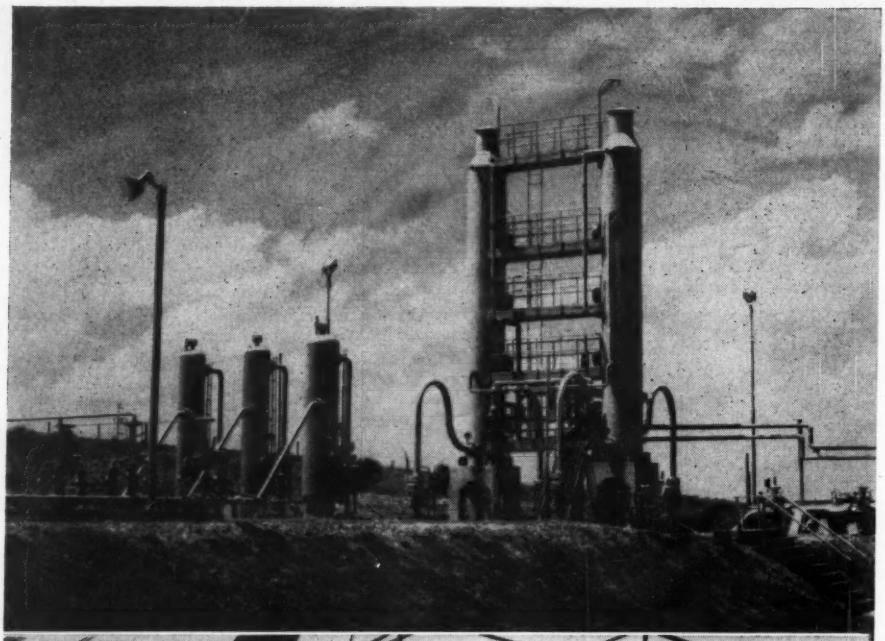
At the same time, another development was taking place in the field. In 1927, acetylene welding of joints was coming more into use. During 1929, arc welding was used extensively on gas transmission lines. In 1930, the shielded arc electrode was brought into use, with the result that the welds were more ductile, hence safer. Most lines were still being built by welding several sections of pipe and then jointing these longer sections with couplings. This resulted in a flexible line able to provide for expansion and contraction caused by temperature changes.

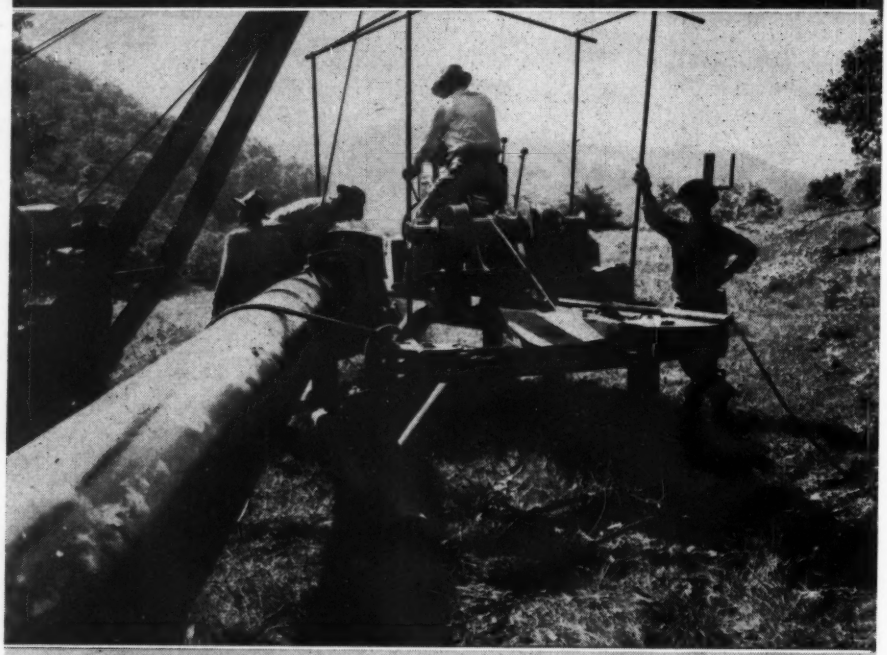
Up to 1931, long gas lines of large diameter pipe had been a new undertaking. There was no adequate background of experience in laying the pipe, in welding, in the use of couplings and in testing the lines. Also, mill standards were not as high as they later became. A certain tendency still existed to provide extra thickness in pipe walls for corrosion. Taken all together, the art was new and so it was considered good engineering judgment to provide a safety factor of 4 to 5 on the ultimate tensile strength of the steel. Actually this was a safety factor of 2.5 to 3.0 on the yield strength of the steel.

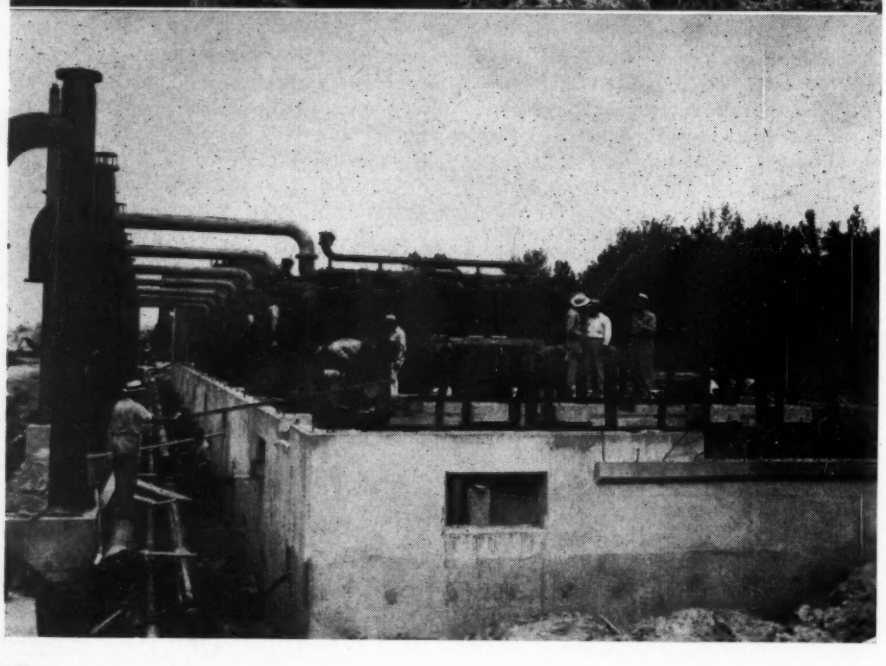
In 1936, the Hope Natural Gas Co. built an all-welded line designed with a safety factor of 3 on ultimate tensile strength. In 1939, the Northern Natural Gas Co. extended their system 243 miles with 16-in. pipe with about the same safety factor. However, this line was designed for a safety factor of 2.2 on yield strength, and is believed to be one of the first natural gas transmission lines whose safety factor was based on the yield strength.

As illustrated in Table 1, gas transmission lines constructed from this time on were designed with a safety factor based upon the yield strength. Uncertainty about welding, non-uniformity of thickness of the pipe and erratic physical characteristics of steel in the pipe had largely disappeared. The 26-in. line of the Cities Service Transportation and Chemical Co. was designed with a safety factor of 1.4. The 24-in. Tennessee Gas and Transmission line, which is now being built, has a safety factor of 1.4. The 22-in. line, which the Hope Natural Gas Co. had proposed to construct in 1944, was designed on a safety factor of 1.4.

The use of safety factors of 1.4 to 1.5 on the yield strength shows complete confidence in the welding methods, in the pipe strength and uniformity and in construction methods. This practice has been made possible







because the procedure of carefully inspecting and testing materials and workmanship of every mile of line has become a part of modern construction methods. The pipe manufacturers' guarantee of a specified yield strength is as reliable as their inspection and testing procedure. Sampling and testing of each welder's work before permitting him to weld joints on a pipe line helps to assure uniform welding. The hydrostatic test of completed sections of the line at pressures reasonably above the maximum working pressure and below the yield strength, eliminates faulty materials and workmanship. These testing procedures make it possible to design on the basis of a maximum working pressure equivalent to about 70% of yield strength.

The chart, Fig. 1, shows the relative trend of hoop fiber stress and yield strength on typical gas lines constructed from 1920 to date. It illustrates that the yield strength has risen from 25,000 psi in 1920-1928 to 50,000-55,000 psi. This is an increase of about 120%. During the same period, the fiber stress increased from 10,000 psi to 36,000 psi, or about 260%. While only several examples have been illustrated on this chart, they are representative of the trend in fiber stress as compared with the trend in yield strength. This forcefully shows that natural gas transmission line practices have advanced to a point where much more efficient use is now being made of the strength of the pipe.

When welding of gas pipelines first began, there was considerable objection to a solidly welded line without couplings or joints to provide for expansion. It was believed that longitudinal stresses resulting from the expansion and contraction of the pipe due to temperature variation would cause the pipe to fail. The first large all-welded pipelines were consructed in California and in Texas[4] in locations where the temperature change was small. However, the construction of the Hope line in 1936 with solidly welded construction helped dispel this fear and all-welded construction has now become accepted practice.

DEHYDRATION

High pressure solid type adsorbent gas dehydration plant, Oklahoma Natural Gas Co.

CONSTRUCTION

A new type bending machine used in making cold bends on 24-in. Tennessee Gas and Transmission Co. line.

COMPRESSION

Angle type engine-compressor units on 24-in. Tennessee Gas and Transmission Co. line.

Compressors

Until about 1940, horizontal slow speed gas engines were used almost universally as prime movers in gas booster stations on long gas transmission lines. The simplicity and reliability of the horizontal unit had proved itself in over 40 years of use. It warranted the confidence placed in it by pipeline men. These slow moving engines do not fail easily or quickly, and if carefully checked and repaired, their maintenance cost is reasonable. However, in the last four years, many medium speed multicylinder angle type engine-compressor units have been used for this service.

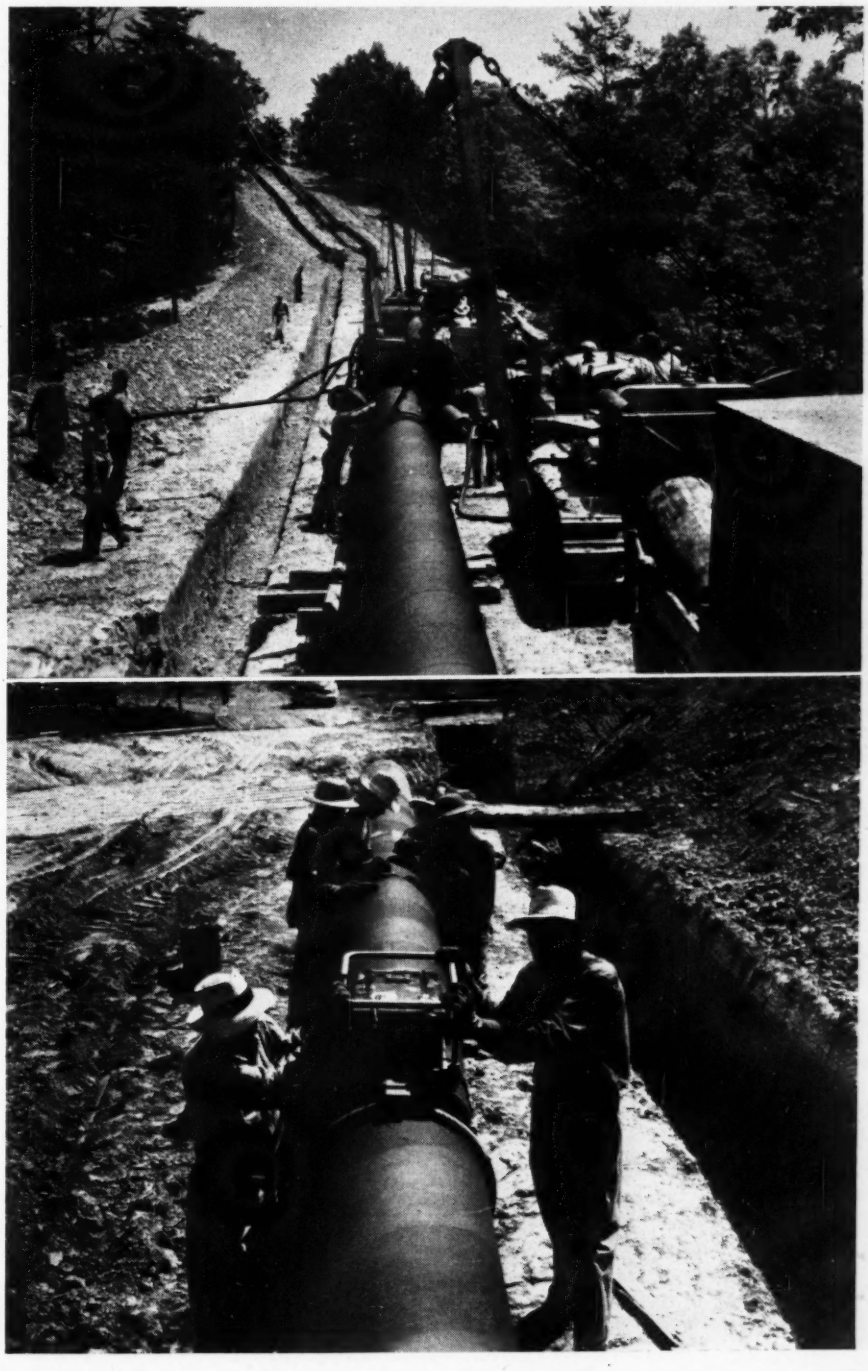
When the new medium speed multicylinder angle type engine-compressor units were brought out in 1937, the gas industry awaited the proof of their dependability and reasonable maintenance cost before adopting their general use on long gas transmission lines. However, many of these units were installed in refineries, gasoline plants and condensate recycling plants. Since 1942, the gas companies have found it difficult to secure anything but an angle unit, and so this type unit was installed in new booster stations or station additions on long transmission lines. Now many of these units have been pumping on gas lines three years or longer, so there has been ample opportunity to establish their reliability and reasonable maintenance cost.

Most of the angle type units have a stroke of about 14 in. On the basis of 300 rpm, the average piston speed is about 700 ft. per minute. The horizontal units most commonly in use on long transmission lines have a 36-in. stroke and a speed of 125 rpm, which indicates a piston speed of 750 ft. per minute. So the cylinder and piston wear should be about the same for both types. The ignition systems of both the slow speed and the medium speed units are very similar, both having taken on the characteristics of an automobile engine ignition. The incentive to install this new unit in new booster stations is the lower station cost. The weight, floor area and volume required is so much less per horsepower, that the station size and cost is materially less than for a station using the slow speed horizintal unit. As operators are convinced of the dependability and reasonable maintenance cost of this type unit, the lower original cost of the station will result in acceptance for pipeline booster service.

Capacity Factor

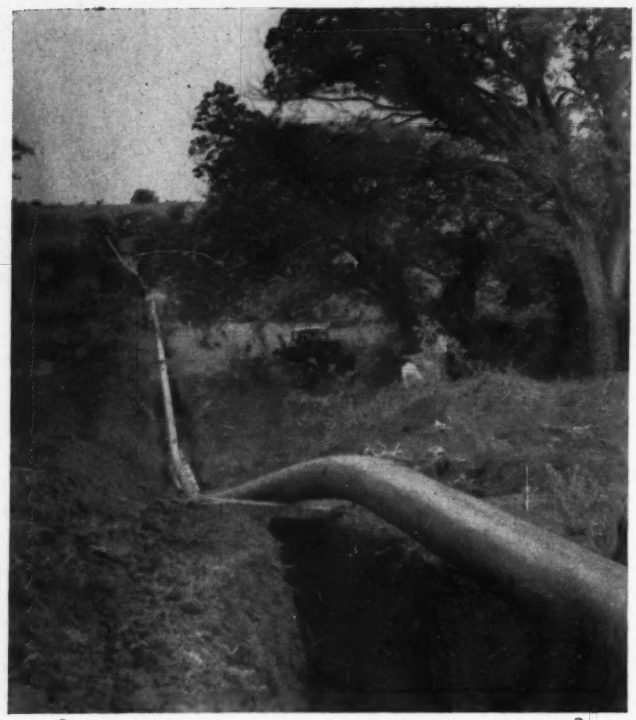
The term "capacity factor" as applied to natural gas transmission lines is the ratio of the average load to the capacity. Many companies having closely interconnected networks of gas pipelines cannot determine the capacity of their systems and so they do not know the capacity factor. The various sections of such systems have been built over a period of years with different working pressures, lengths and sizes of pipe. As a result of changes in field pressure, and the growth or decline of loads, operating conditions have changed to the extent that the original design capacity has little meaning in the system network. In this type of system, the criterion of operation in lieu of a capacity factor is the load factor, or the ratio of average to maximum load.

It is not economically feasible to construct a long line unless a high capacity factor can be assured, because of the large investment required and the high fixed charges resulting. There are several ways of establishing a high capacity factor, including the sale of gas on an off-peak basis and the use of underground storage reservoirs. When a new line is contemplated, contracts offered to dis-



PROTECTION

On the Tennessee Gas and Transmission Co. Line: (above) application; (below) electronic holiday detector.



Oklahoma Natural Gas Co.'s 1000 psi. all-welded line.

▲

tributing companies and to industrial concerns can be arranged to provide lower rates for gas sold during off-peak periods and thus offer an incentive for off-peak load. The large industries will purchase gas on this basis, provided that the gas rate will compete favorably with other available fuel and will allow a margin for the cost of installation of necessary standby fuel facilities.

There has been an increasing use of old gas fields as storage reservoirs. Gas is injected into these fields during periods of low demand and taken out during periods of high demand, thus cushioning the effect of variations in demand. It is becoming the practice to use such fields when available to help develop the high capacity factor necessary for new pipelines.

The capacity factor of most long gas transmission lines constructed in the period from 1926-1931 was about 60 to 70% at the time the lines were built. Now, most new lines have a capacity factor of about 80%.

The new lines of the Cities Service Transportation and Chemical Co. and the Tennessee Gas and Transmission Co. have been planned on the basis of high capacity factors. The large base load of the Cities Service system will provide a high sustained load for the Hugoton line. The large storage capacity of the Appalachian Area will help to establish a high capacity factor on the Tennessee Gas and Transmission Line. The existing partially depleted fields of this area will be called upon for much of the peak demand. Other new lines from concentrated production areas to the large markets are expected to have high capacity factors because of the necessity of carrying great volume of gas long distances economically.

The idea has recently been advanced that natural gas should be conserved for 'higher' uses, such as domestic consumption, and that it is not to the best interests of such consumers that gas be sold at low off-peak rates for boiler plant fuel. The problem of the transmission of natural gas from distant fields is largely a question of cost. As has been stated, it is not economically feasible to construct new lines unless they have a high capacity factor. It would be perfectly sound to build a line for a low capacity factor if consumers could be expected to pay a sufficiently high rate. Under prevailing gas rates and the present field cost of gas, it is not practical to build new lines with much less than 80% capacity factor. As the load factor of most gas distribution centers, which might be terminal points of long transmission lines, is much lower than 80%, provision must be made to complement this load. When the sale of gas on an off-peak basis will help to establish the capacity factor at the point where the construction of a new line is feasible, such sale is to the interest of the domestic consumer because it is only by the construction of such a line that distant sources of gas become available.

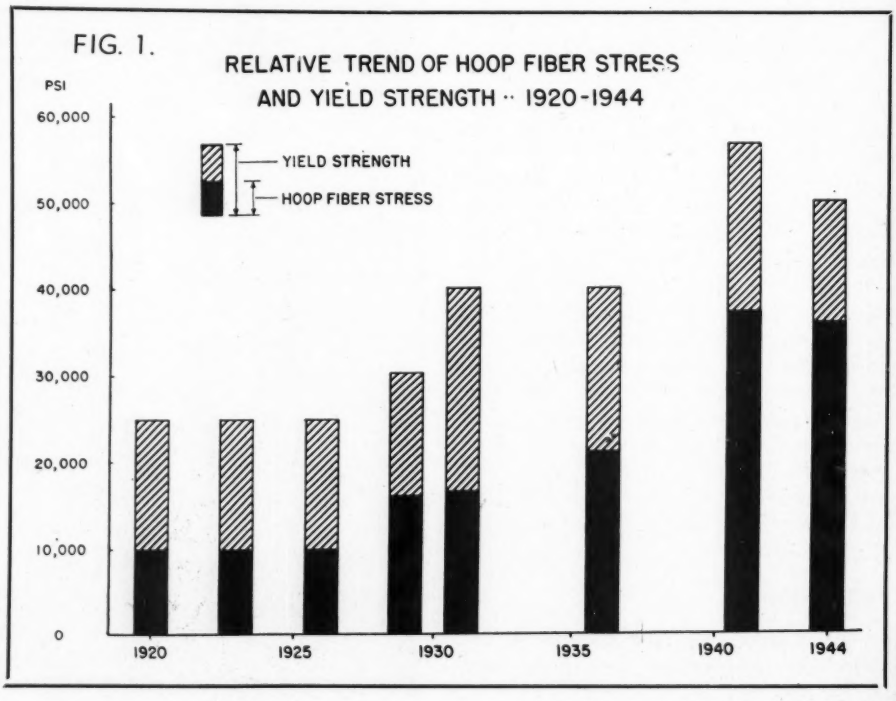
Conclusion

The art of transmitting the large volumes of natural gas has changed from an initial stage in the period from 1926-31 during which suitable high strength pipe was being developed and methods of construction were changing, to the present period in which improved materials are available, workmanship is of high caliber and the maximum use is being made of pipe strength. The trends to minimum cost during this time are characterized by the use of maximum working pressures which will stress pipe to about 70% of the yield strength, by the installation of medium speed angle type compressing units and by capacity factors of at least 80%.

ACKNOWLEDGMENT

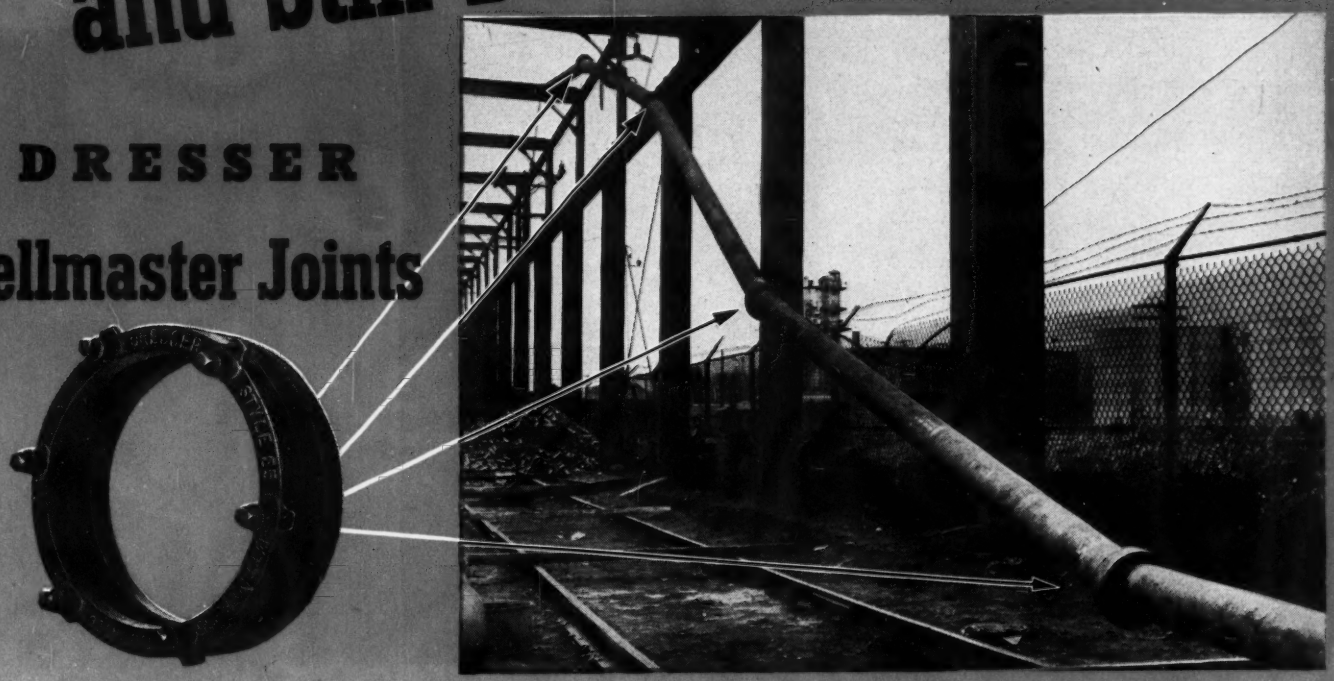
I thank the Oklahoma Natural Gas Co., and the Tennessee Gas and Transmission Co. for the use of the pictures exhibited, and the Cities Service Transportation and Chemical Co. and the Tennessee Gas an Transmission Co. for valuable information furnished.

FIG. 1.



25 Feet in the Air . . . 25 psi. and Still Bottle-Tight with . . .

DRESSER Bellmaster Joints

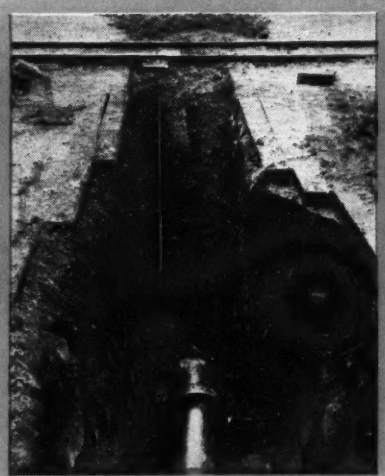


...uelling tests by Dresser engineers and by users have ...ved the remarkable performance of the new Style 85 ...resser Bellmaster Joints for cast-iron pipe. Above, five ...ngths of pipe, joined with Bellmasters, tested tight at 5 lbs. air pressure and held tight at 25' elevation.

What does this flexibility and tightness mean? Lines ...ay be joined and lowered from above ditch—trench ...regularities are taken up by deflection at the joint—...urves may be made with straight lengths of pipe—stresses and strains are absorbed—lines remain tight under virtually any operating conditions.

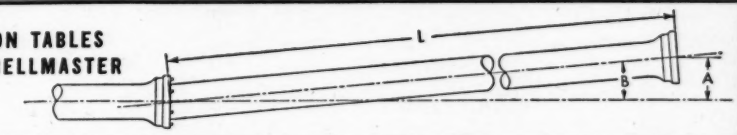
The Bellmaster is both light and strong. Completely factory-assembled, it is installed in 2 to 5 minutes or less. It fits within the bell, safe from corrosion. Investigate the Dresser Bellmaster . . . Compare costs. For here is the greatest development made in cast-iron pipe joining in over 100 years.

Catalog 441A on request.



Vibration does not harm this Bellmaster line under tracks.

DEFLECTION TABLES
DRESSER BELLMASTER
STYLE 85



Size	Maximum Safe Deflection			Permissible Deflection for Joint Assembly		
	Angle B	Distance A		Angle B	Distance A	
		L = 16′	L = 18′		L = 16′	L = 18′
3″	9° 0′	30⅜″	34¼″	5° 30′	18½″	20¾″
4″	8° 30′	28⅝″	32¼″	5° 10′	17⅜″	19½″
6″	8° 0′	26⅞″	30¼″	5° 0′	16⅞″	18⅞″
8″	7° 0′	23⅝″	26½″	5° 0′	16⅞″	18⅞″
10″	6° 30′	21⅞″	24½″	4° 30′	15⅛″	17″
12″	6° 0′	20¼″	22¾″	4° 30′	15⅛″	17″
16″	5° 0′	16⅞″	18⅞″	4° 0′	13½″	15⅛″

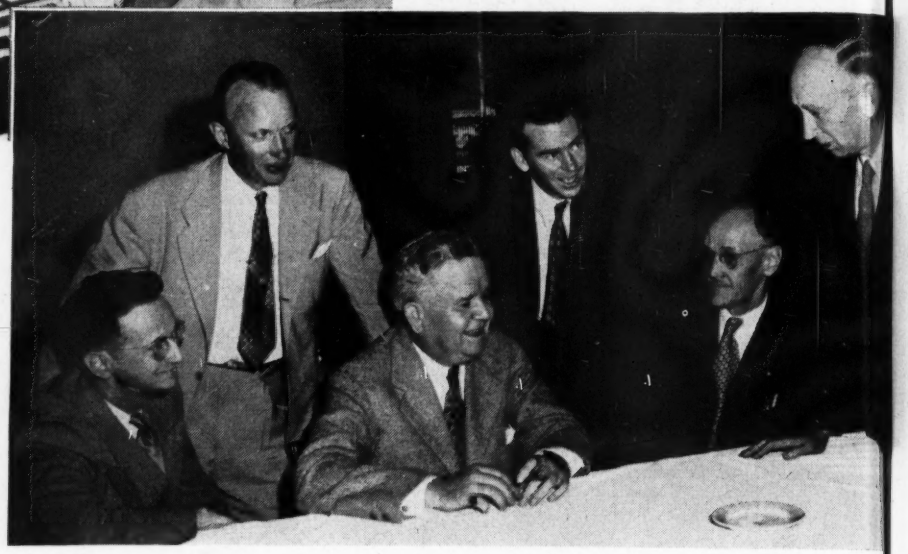
Bellmaster ability to realize deflection cuts down installation and maintenance costs.

DRESSER MANUFACTURING COMPANY • BRADFORD, PA.

ONE OF THE DRESSER INDUSTRIES

LEFT: At the Hotel Adolphus, Dallas (l. to r.), **A Burk,** public utility analyst, Duff & Phelps; **Sc Hughes,** general attorney, and **F. W. Smith,** vic president, Southern Union Gas System; **Carl C Liden,** Ohio Foundry & Manufacturing Co., **Ro Byron,** vice president, and **H. V. McConkey,** se retary, Southern Union Gas System.

BELOW: Representing the Engineering Committe IOCC, Summer meeting at Denver in June, wer **J. F. Gallie,** Arkansas; **Dean W. H. Carson,** Okl homa; **Dr. E. L. DeGolyer,** Texas; **John M. Kell** New Mexico; **Dr. Eugene Stephenson,** Kansa **Dr. F. M. Van Tuyl,** Colorado.



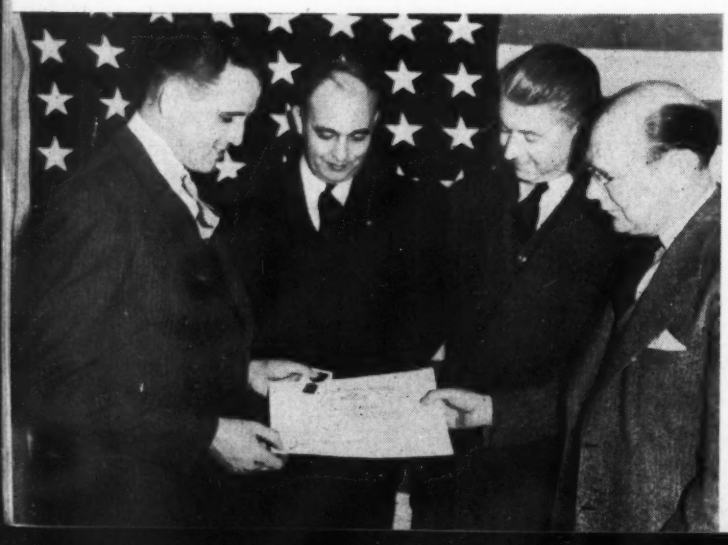
Philip S. Harper (right), president of Harper-Wyman Co., of Chicago, receives Army-Navy "E" from **Commander James Ward,** U. S. Navy.

GAS CAMERA

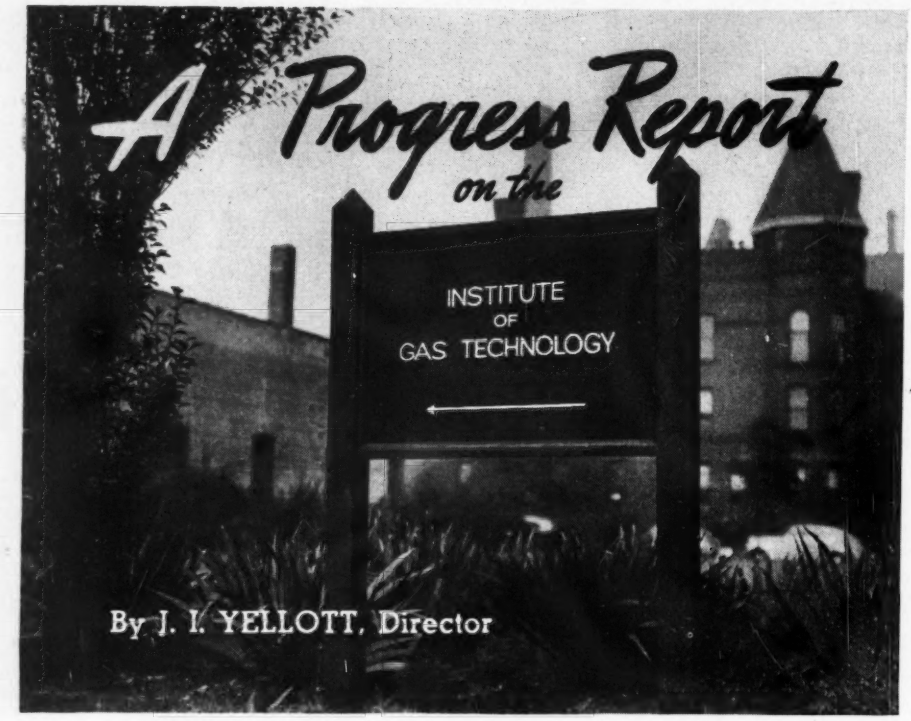
Russell F. Sarrine, natural gas transmission department, Consumers Power Co., who revived a woman victim of electric shock, receives the Edison Electric Institute Medal and Certificate for Resuscitation. Left to right: Mr. Sarrine, **H. L. Fruechtenichit,** general natural gas production and transmission superintendent; **D. E. Herringshaw,** general supervisor of gas operations, engineering and construction; and **H. James Neilson,** gas transmission superintendent.

CIRCLE: **Lt. Gladys Price,** USNR, former Southern California Gas Co. home service director, now at Naval Air Station, Jacksonville, Fla.

BELOW: Pictured at a recent AGA meeting are two prominent pipeline men, **George B. McComb,** sales manager of The Barrett Co., New York, and **Frederic A. Hough,** executive engineer, Southern Counties Gas Co., Los Angeles. Photo by **A. Gordon King.**



Now available . . .
Rheem Arrowhead
Automatic Gas
Water Heater



THE Institute of Gas Technology, established during the last months of uneasy peace before Pearl Harbor, is now completing its fourth year of operation. The story of the Institute's founding has been told in previous issues of *G A S* and most members of the Gas Industry are familiar with the objectives for which it was established. To summarize these objectives, the Gas Institute was set up to provide a center where students at the graduate level could be educated in the sciences and technology fundamental to the operations of the Gas industry, where both basic and applied research could be carried out in the production, distribution, and utilization of fuel gas, and where scientific information related to the Industry could be collected and disseminated.

Like every other American institution, the Gas Institute has been profoundly affected by the war. Since February of this year, when changes in Selective Service regulations caused the student body to enter the armed forces or war industry, the Institute has been entirely devoted to research in the interest of the Gas Industry. Accordingly, it is appropriate to report to the Industry on the current activities and future plans of the Institute.

HISTORY AND OBJECTIVES

The Institute of Gas Technology is an independent educational and scientific institution, supported by its member companies, now 63 in number. Its affairs are guided by a board of 22 trustees, each of whom serves a three-year term of office. Frank C. Smith of Houston was the chairman of this board for the first three years of the Institute's existence, and his vigorous and effective leadership was largely responsible for its establishment. Believing that three terms in office were enough, Mr. Smith was not a candidate for re-election at the 1944 annual meeting, and the position of Chairman was filled by the election of Frank C. Lerch, Jr., of New York.

The Institute of Gas Technology is incorporated under the laws of the State of Illinois for education and scientific purposes. In order to carry out its objectives more effectively, it was affiliated with Illinois Institute of Technology, one of America's great engineering colleges. The President of Illinois Tech, Dr. Henry T. Heald, also holds the same position in the administration of the Gas Institute.

1. Educational Program: The educational program of the Institute is considered by many to be its greatest contribution to the Industry, since the training on the graduate level of an outstanding group of young men in the sciences and administrative techniques of the Gas Industry cannot fail to produce a new generation of leaders who will carry on the Industry in the face of its growing competition. The Gas Institute's educational program is unique at the graduate level, since it embodies the cooperative principle, which is now widely established in undergraduate scientific education.

The Fellows of the Gas Institute will regularly spend one-third of each year in actual field work, thus acquainting them with the facts of life in the Gas Industry. As in the case of all scientific education, and indeed virtually all education for those above 18 years of age, the Institute's program has been discontinued for the duration, since Selective Service does not permit the deferment of young men under 26 years of age for any reason other than the most essential employment.

The educational program reached its high point during the fall of 1943, when a total of 22 outstanding young men were enrolled as Fellows in the Institute. As Selective Service regulations changed, this number diminished, until at the present time, only two Fellows remain. The United States Navy, in its Radar and Corps of Supply activities, has absorbed most of the other young men. Before they left the Institute, however, five men had completed their requirements for the degree of Master of Science, and their theses have already contributed significantly to certain phases of gas technology.

It is hoped that the educational program can be resumed by September, 1945, and provisions are being made to welcome the Fellows back to the Institute as they return from the service. They will first be assigned to research positions, and when a sufficiently large number have returned, classes will be resumed. There will unquestionably be a serious gap in all graduate study programs, because for a period of almost three years, there will be virtually no new graduates from the scientific schools. However, there will be a large backlog of young men in the armed services who will be seeking graduate training; and it is to this source that the Institute will look for its students in the immediate post-war period. The nation will, in the immediate post-war period, face a very serious shortage of men trained beyond the bachelor's degree. This shortage can have serious effects upon the scientific future of all industry because research can today only be accomplished by those who have acquired advanced training.

2. Basic Research: The second major purpose which led to the founding of the Institute of Gas Technology was the awakening realization of the imperative need of research in the Gas Industry. Without belaboring this point, it should be reiterated that one company alone in the electrical industry is spending more annually for

research than the entire Gas Industry. However, magnitude of expenditure alone is not an adequate criterion. Expenditure must be wisely directed, and blessed with inspiration, or even the most prodigious sums might be entirely wasted.

In the formation of the Institute of Gas Technology, it was provided that research on broad and fundamental problems of the Industry should be undertaken as a responsibility of the Institute itself, and it was interest in this phase of the program which caused many of the original member companies to support the Institute. It was also realized that the Gas Industry needed a research center, where an individual member company could bring its own problems, and have the benefit of a research organization as genuinely interested in those problems as if the laboratory were the company's own research division.

Only a few companies in the Gas Industry are large enough to support elaborate research organizations of their own, and, for the great majority of smaller utilities and appliance manufacturers, a central laboratory, where individual problems can be studied by competent men with adequate equipment, will represent a tremendous step forward. During the past two years, the Institute has undertaken over 30 such sponsored investigations, and 20 are in progress at the present time. One of the cardinal principles underlying sponsored investigations is secrecy, and obviously the nature and extent of these projects cannot be revealed here. However, it is appropriate to say that the great bulk of this work is being done for appliance manufacturers, who are looking forward to the time when they can again furnish the households and industries of America with equipment of outstanding merit.

3. An Information Center: The third major activity of the Institute as envisioned by its founders, was the collection and dissemination of information. This obviously necessitated the formation of a library, and the Institute can now report that it has a working library of real effectiveness. More than 4000 volumes are already on hand, including bound sets of the most important periodicals related to gas technology. There will be no attempt to duplicate the other great scientific libraries in the Chicago area, but it is the intention of the Institute to possess eventually every book which makes a real contribution to the field of gas technology, as well as bound volumes, either in the original or on microfilm, of the most important periodicals in the entire world which relate to the welfare of the Industry.

Impact of War: The broad objectives of the Institute have of course felt the impact of the war. It has been difficult to hire competent research men and women, and materials and instruments have often been unobtainable. Despite this fact, the Institute has grown steadily. Its annual budget is now approximately $250,000, of which 40% will come from the direct and undesignated contributions of its members, and the remainder will be devoted to sponsored research projects. The Institute has made its own contribution to the war, not only in the person of its Fellows, but also in the carrying out of certain specific investigations for branches of the armed services. In cooperation with the Armour Research Foundation and Illinois Institute of Technology, special services are being rendered to the Office of Scientific Research and Development and to the United States Navy through participation in the V-12 program. As the war apparently approaches its climax, the Gas Institute is mobilizing itself to expand as rapidly as possible in the post-war period, to reestablish its educational program, and to undertake as large a load of basic research as its space and facilities will permit.

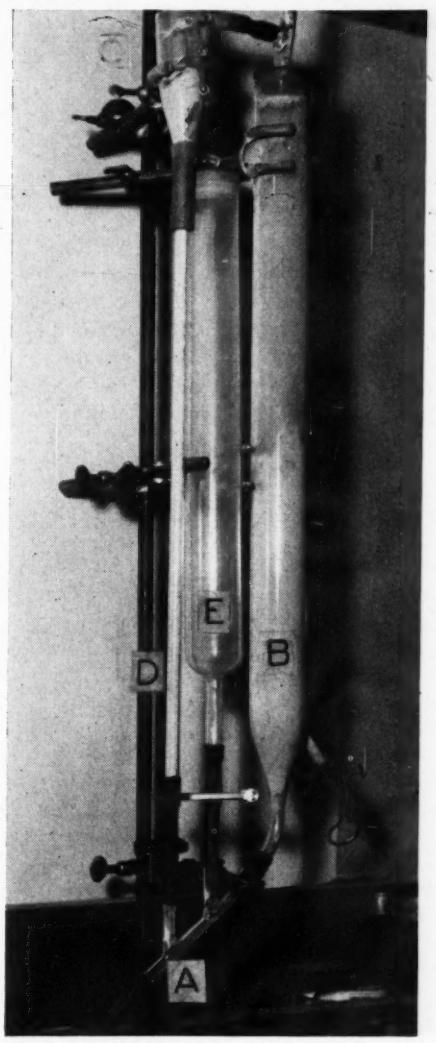


FIG. 1. In this small laboratory model of a fluidization apparatus, air enters through the inlet pipe A and fluidizes the finely divided solid material in reaction chamber B. The cyclone separator C returns the solids to the standpipe D. Additional material can be added through the supply chamber E.

BASIC RESEARCH PROGRAM

To the Industry as a whole, the most important part of the Institute's activities is its basic research program. Begun in a very modest way in 1941, this program has now expanded to the point where some $60,000 was expended during the past fiscal year, and this sum will be increased during the coming year. It is understood by the Institute that the Industry faces a number of very important and serious problems. Probably the most pressing of these is the development of a low first-cost gas production apparatus, preferably to produce high Btu. gas. The significance of househeating load, and the continued maintenance of the cooking load, is thoroughly appreciated, and accordingly the largest portion of the basic research program is related to this general objective.

Two Gasification Projects: Under the head of gasification, the Institute has two major projects, one involving the use of a highly superheated steam and fluidized pulverized coal. The second concerns a continuous gasification system, under pressure, using "atomized" coal, produced by the Institute's newly developed coal pulverizer.

Both of these gasification projects are being carried out simultaneously, and both will require the determination of many fundamental variables before they can go forward with utmost effectiveness. The relatively new technique known as fluidization is one which has been under study at the Institute for the past three years. Well known to those in the petroleum refinery industry, fluidization is as yet so new and unpublicized that it has not received the attention which its potentialities deserve. Briefly, fluidization consists of mixing finely divided solid particles, in a dense phase, in a slowly rising stream of gas. When, for example, a glass tube, partly filled with finely divided solid material,

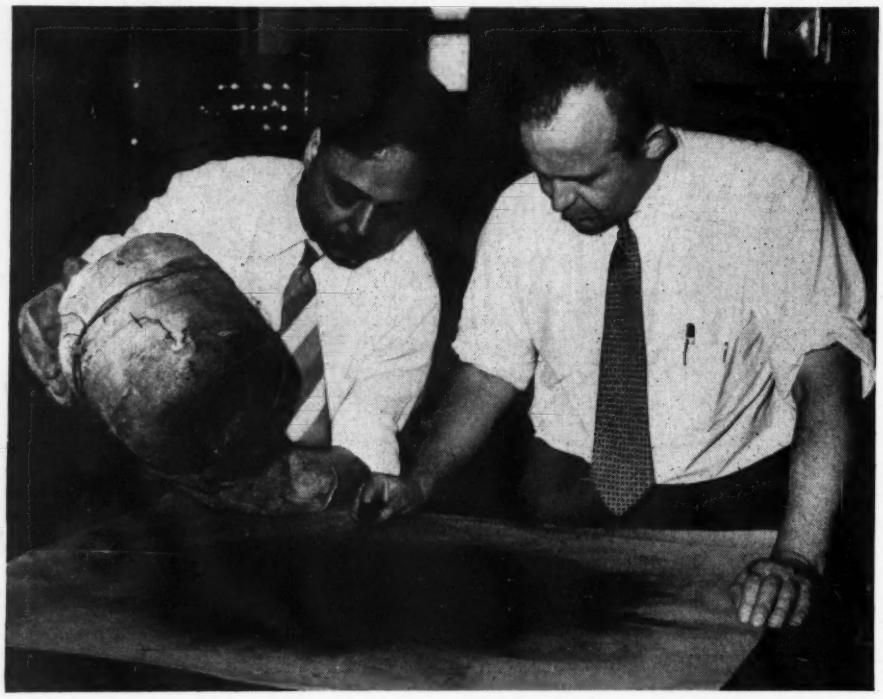


FIG. 2. Senior Chemical Engineer A. D. Singh and Director Yellott examine the product from the "coal atomizer."

is provided at its base with a stream of gas or air, and the inlet valve is opened, as in Fig. 1, the introduction of the gas will cause the particles to move in violent turbulence. The entire stream will take on "the appearance of a boiling liquid and play like a fountain." This description of the fluidizing process goes back to the first patent on this subject, that of Robinson * in 1879.

One glance at a fluidized system in operation will immediately suggest to those skilled in the art a vast number of applications of this extremely effective means of causing intimate contact between solids and gases. The largest use of this technique at the present time is to be found in the "Fluid Catalyst" cracking plants, which have been such a tremendous asset to the oil refinery industry in its task of supplying gasoline for America's war effort. The process, however, is equally well adapted to virtually any other situation where intimate contact between fluids and solid particles is needed. The size of equipment is almost unlimited, since it can vary in height from the 24-in. experimental glass tubes used at the Institute to the 20-story units used in the oil industry. The quantity of solids involved may vary from a few spoonfuls in the glass model, to many carloads in the commercial unit. As a chemical engineering tool, and particularly as an aid to the Gas Industry, this new technique is deserving of vigorous study. Several projects are now devoted to this process, one being a study of the basic laws governing the phenomenon, and another related to the removal of hydrogen sulfide by fluidized iron oxide. A recent publication by the Institute (1) gives some of the history and applications of fluidization. Reprints are available for those interested.

*U.S. Patent No. 212,508

Coal and Oil Pulverization: A new development of great importance is also at hand in a radically different type of pulverizer, which is now under investigation at the Institute. It is not appropriate at the present time to reveal the details of its construction, and it must suffice to say that this new pulverizer can pulverize coal to such a degree of fineness that the term "coal atomizer" is not inappropriate. (Fig. 2). By the use of the bituminous coal in a single stage pulverizer, it is possible to produce an acceptable grade of powdered coal, which is suitable for use in the boilers of manufactured gas plants. By causing the pulverization to take place in a number of stages, particles of extreme fineness can be produced at very low cost. The complete gasification of "atomized coal" has great possibilities as the method of producing water gas continuously and cheaply.

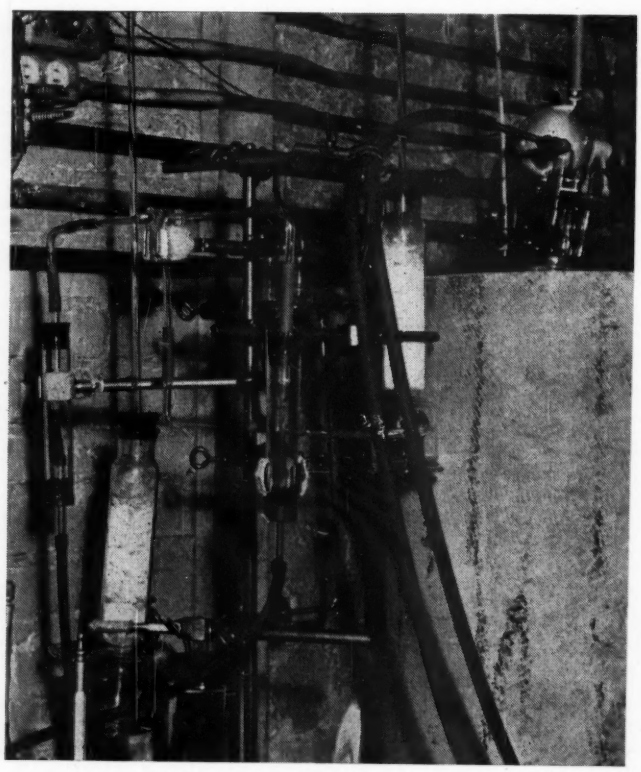
The new pulverizer has also been applied to the processing of oil shale, with very encouraging results. In a three-stage process, it is possible to grind oil shale to 200 mesh fineness, and to produce a material which flashes at 300°F. By treating this finely powdered material in a fluidized system, using steam of controlled temperature, it is expected that the oil content of the shale can be distilled off, and recovered at low cost. The solid residue can readily be removed by appropriate separators. By the use of much higher steam tem-

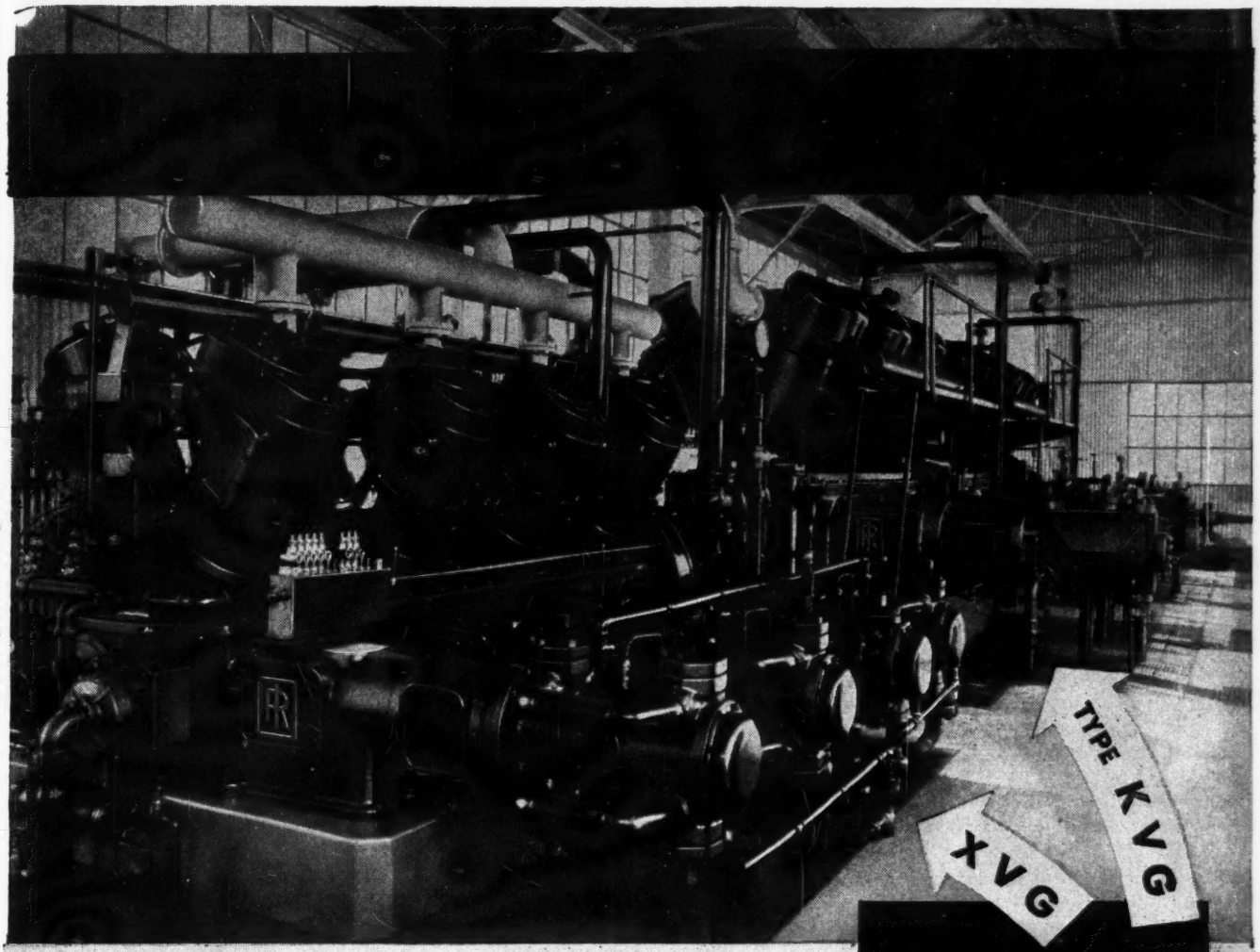
▲

FIG. 3.

In the Fischer-Tropsch "synthetic oil well," hydrogen and carbon monoxide are purified before going to a catalytic reaction chamber.

▼





An 8-cylinder 300-hp XVG, and two 6-cylinder 600-hp KVG compressors in repressuring service.

When introduced twelve years ago, the XVG was *great* because it set new standards in gas-engine-driven compressors for oilfield and refinery service. Its V-angle, multi-cylinder design resulted in astonishing savings in the costs of installation, relocation and maintenance. It also established a new high in over-all economy of operation.

The XVG is even *greater* today. During these twelve years, it has been used in all types of applications, and the experience gained has naturally resulted in many improvements. In all parts of the world the XVG has proved the soundness of the V-angle design and 4-cycle simplicity... and the ability to operate continuously under full load for weeks and months without shutdown. It is still *the* compressor in the 75- to 300-horsepower size range.

The larger KVG compressor was introduced to meet the demand for compressors of larger capacity, and many units are now serving the synthetic-rubber and aviation-gasoline programs. It, too, is a *great* machine because it extends the outstanding features of the smaller machines to the 600- and 800-horsepower sizes. The KVG operates with a fuel economy of 9500 btu or less per horsepower-hour.

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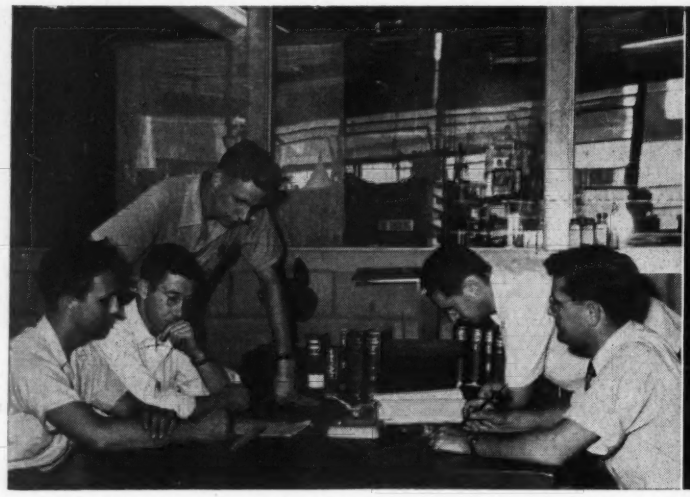

FIG. 4. The organic Sulfur team goes into a huddle at the Gas Institute. Left to right, E. A. Knaggs, F. Lister, H. Hakewill and N. B. Yagol discuss sulfur identification and removal with Senior Chemist S. W. Martin.

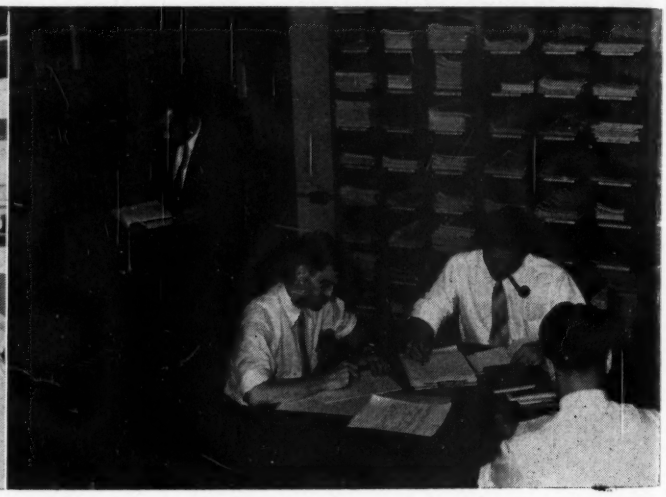

FIG. 5. The Institute's Library is in constant use by the Research Staff and Fellows. Left to right: Junior Chemical engineer Claus Von Fredersdorff, Senior Chemical engineer Vincent de Marchi, Fellow Erwin Strong, and Administrative Assistant George Creelman.

perature, it is expected that an oil gas of acceptable quality can be produced. Such a process would be of particular value in the western states, because of their vast deposits of oil shale. Due to the high percentage of inert material in this shale, it is not economically feasible to transport the unrefined material over long distances. It would be possible, however, to extract the oil at the mine, and convert it into gas which can be transmitted through pipe lines.

For the protection of its members, the Gas Institute makes a policy of applying for patent protection on all of its developments, and further details of the pulverizer and the oil shale recovery apparatus cannot be disclosed at present. It is appropriate to state, however, that the new pulverizer apparently has tremendous applications in the production of finely powdered material which can subsequently be treated by fluidization or other processes.

In any process involving the treatment of finely powdered material, the removal of dust from the gas stream is a matter of considerable importance. It has been found by some experimenters, notably by St. Clair (2) of the Bureau of Mines, that intense sounds of high frequency, even in the inaudible range, have the property of causing fine dust particles to coagulate. Some years ago a powerful supersonic whistle type generator was devised by Hartmann, a Danish scientist, whose writings were widely publicized in the physics literature. (3) Starting with the original Hartmann oscillator, the research staff of the Gas Institute has succeeded in producing a new type of supersonic generator, which generates waves of great intensity and controllable frequency, when supplied with gas at low pressure. This new device has already been proven to be affective in the flocculation of dusts, and work is being vigorously pursued to apply it to the elimination of smoke and the removal of dust particles from gas streams.

The interest in ultrasonics at the Gas Institute is also directed toward other properties of these peculiar waves. They are known to have marked heating effects, and also to have germicidal properties. Work is now going forward to endeavor to turn these two properties to the use of the Gas Industry. Although the Gas Institute makes no claim to being a house of magic, it does have every intention of applying the latest developments in physics and chemistry to the fundamental problems of the Gas Industry, and this attack on the supersonic situation is an example of this determination.

Hydrocarbon Research: One of the pass words in hydrocarbon research today is the German combination, Fischer-Tropsch. The reaction originally discovered by the Frenchman Sabatier, in 1904, and developed and publicized by the Germans Fischer and Tropsch in the early 1920's, is of vast technical importance at the present time, and of equally great promise for the future.

Sabatier found that carbon monoxide and hydrogen, when passed over a suitable catalyst at moderate temperatures, could be converted into methane. Fischer and Tropsch discovered that, by the use of proper catalysts and appropriate temperature and pressure conditions, higher hydrocarbons could also be formed, and thus a coal mine, when its coal was converted into water gas, could in effect be made into an oil well. This type of synthetic oil has powered the Nazi war machine, and the current creaking in that machine is largely attributable to the tremendous bombing to which these "synthetic oil wells" in Luena and other centers have been subjected. Without the Fischer-Tropsch process, the Nazis could not have waged a war, because of their lack of natural oil for fuel and lubrication. The Fischer-Tropsch process gave them, in effect, a supply of these materials which was limited only by the amount of coal which was available.

In America, the Fischer-Tropsch synthesis has been investigated by a number of organizations, and it has been definitely demonstrated that the production of oil and gasoline from coal or natural gas is feasible. The major problem to be solved in this case is one of first cost and economics of operation, since, up to the present, the natural product has been much cheaper than any possible synthetic combination.

The major economic problem to be overcome is the fact that the Fischer-Tropsch synthesis yields a crude oil, which must be refined in the same manner as the product of an oil well. If it were possible to direct this synthesis so that a desired specific hydrocarbon product would be obtained, this product to be directly useful as a fuel or a lubricant, the economy of the process would be greatly improved. It is this phase of the project which is being investigated by the In-

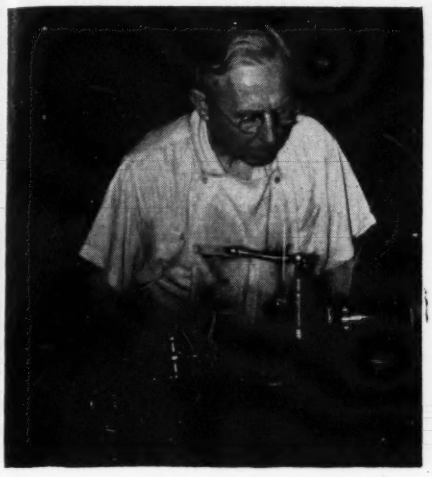

FIG. 6. Charles Johnson, a tool-maker with 30 years of experience, is in charge of the Institute's machine shop.

FIG. 7. Miss Patricia Mack is senior draftsman for the research staff. After art school, she studied engineering at Illinois Tech.

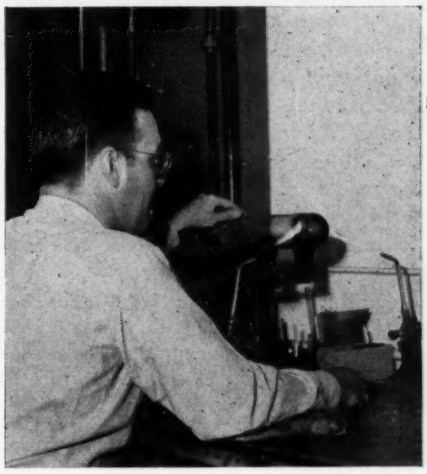

FIG. 8. Hart Foster, the Institute's glass blower, has constructed virtually all of the glass equipment used in the laboratories.

stitute, under the direction of Dr. Vasili Komarewsky, internationally known catalyst specialist, and Dr. Charles Riesz. In a newly constructed laboratory, equipped with the latest devices for safe operation and for careful gas analysis, (Fig. 3) the Catalytic Section is investigating the factors involved in the Fischer-Tropsch synthesis, and in other reactions which are of primary interest to the natural gas industry. A recent publication (4) indicates a step forward in the catalytic dehydrogenation of propane. This work is being extended to other hydrocarbons, and additional results are expected in the near future. The Gas Institute does not expect to duplicate the work of the Bureau of Mines in making gasoline from coal, but it does intend to continue its investigation of the Fischer-Tropsch synthesis as applied to both natural and manufactured gas.

"Isotemp" Oven: It is well recognized that the continuation of the cooking load is vital to the future success of the Gas Industry. Excellent work on the fundamental nature of the gas flame in domestic appliances is being done by the AGA Laboratories at Cleveland, and the Gas Institute is careful not to duplicate this work. However, there are a number of other aspects which are not being investigated elsewhere, and some of these are now being studied at the Institute. Of particular interest is a new oven, which is now being tested in an effort to learn the effect of combined pressure and radiant heat upon oven cooking. This new device, known as the "isotemp oven," is expected to be a part of the future cooking machine. Once again, this investigation is frankly experimental, and it is being studied primarily because it seems to have promise in the direction of a definitely controlled oven temperature, a high efficiency, and a possible reduction in the time of cooking. The results of this investigation will be made public just as soon as they are made available, and it is hoped that a real advance will be made in the art of cooking.

Sulfur Removal: The oldest and one of the most important projects now under way at the Institute is that of identifying and removing the organic sulfur components of manufactured and natural gas. This project was established as the first study to be undertaken by the Gas Institute in 1942, and it has been financed jointly by the American Gas Association, the Rochester Gas and Electric Corp., and the Institute. The project is divided into two parts, the first being directed toward the identification of the organic sulfur components, and the second to an inexpensive and effective means of removing them. Since most manufactured gas companies keep the sulfur content of their output to a very low figure, the analysis of the organic sulfur remaining in the gas is a rather difficult matter. However, through refinement of technique, Dr. Samuel Martin, who is in charge of this project, and his associates (Fig. 4) have found it possible to determine accurately and reproducably sulfur contents of as little as one-tenth grain per 100 cu. ft. Studies are also being directed toward various liquid absorbent methods of organic sulfur removal, and fundamental data are being obtained on the liquid purification processes.

The Library in a Research Program: Mention has already been made of the Institute's library, but this report on research activities would not be complete without a more detailed discussion of the function of a library in a research program. Any competent research man realizes that the first step in any investigation must be a study of the literature, because in many cases he will find that his problem has been studied by others, some of whom may have attained satisfactory results, thereby obviating the need for his investigation of their particular phases of the work. Others may have run up against apparently insurmountable objections, which he, with a fresh viewpoint, may be able to overcome.

Accordingly, the carrying out of a complete literature study must precede any really comprehensive laboratory investigation of a problem. (Fig. 5). In order to do this, a working library must be available, with bound volumes of the important periodicals, with complete sets of the various journals and abstracts, and with quick and easy access to other libraries where more obscure journals may be kept. All of these activities are now being carried out through the library of the Gas Institute. A growing collection of reference books and periodicals makes possible the completion of the major part of a literature survey without the necessity of calling upon other libraries. However, when such assistance is necessary, the other libraries in Chicago, including the unsurpassed John Crerar Technical Library, are at the disposal of our research men. Inter-library loans among the members of the Special Libraries Association make possible the obtaining of virtually any issue of any journal in a remarkably short time. Photoprints may be had when a few pages are desired, and microfilm techniques

make possible the copying of an entire volume on a small roll of film. For example, in the study of the supersonic generator, it was found that only the Library of Congress contained Hartmann's original book on the subject. Within a few days, the entire 260 pages of this volume were transferred to microfilm, and were available to the Institute's research staff through its microfilm reader. In the future, it is expected that microfilm reproduction will obviate the necessity for possessing acres of bookshelves, particularly for journals to which reference is made infrequently.

One of the remarkable aspects of this war has been the reliability with which foreign publications have reached our library. However, it has been impossible to obtain subscriptions to some of the more important foreign journals, and it is hoped that back files of these publications can be completed through the microfilm method when the war is over.

The Institute is adding a Research Librarian to its staff. She will be particularly responsible for the making of literature searches, thus enabling the laboratory scientists to devote more of their time to their specialized field of activity. The services of a translator will also be available, so that original material in Russian, German, French, and the other languages can be studied by research men with a minimum of wasted time. It is expected that a file of important translations will be established, so that these can be made available at minimum cost to member companies and other libraries, using photoprints or microfilms.

FACILITIES AND STAFF

The Institute of Gas Technology is located on the campus of Illinois Institute of Technology, adjacent to the Armour Research Foundation. Through the close contacts which are maintained with those two institutions, the relatively new Gas Institute has access to facilities and equipment which would otherwise be entirely unobtainable during these war years. For example, the electron microscope of the Physics Department of Illinois Tech is now available for the study of carbon black problems, and other fine particles may be examined at magnifications up to 50,000.

The excellent X-ray equipment of the Armour Research Foundation can also be used for special projects which require this type of study. Unexcelled spectroscopic equipment is available in the Physics and Chemistry Departments of Illinois Institute of Technology, where infra-red and Raman spectra can be applied to gas industry problems. Ultra high speed photographic equipment, and other effective modern devices are also available at these sister institutions.

During the past year, the floor space of the Institute has been doubled, while shop, (Fig. 6) drafting, (Fig. 7) and glass blowing (Fig. 8) facilities have been provided. A new laboratory has been erected to house both of the major gasification projects. Negotiations are being completed with a leading contributor to the Institute to make available laboratory space for a location where pure natural gas is available in any quantity.

The Gas Institute is looking forward to the building of a really suitable structure in the post-war period. At the present time, space is available for most of the Institute's needs, since the laboratory and classroom space originally designed for the educational program has been converted to research purposes. However, in the post-war period, it is expected that excellent student laboratories will be provided, as well as special laboratories for the study of fluid flow and measurement, heat generation and radiation, and other problems which are fundamental to the Gas Industry.

The staff of the Institute has grown continuously during the past year. In June, Mr. L. J. Willien, (Fig. 9) well known to all members of the Industry and particularly to those on the Pacific Coast, became Associate Director, and will be responsible for gasification research. Dr. John J. S. Sebastian came to the Institute in May, after 18 years of experience in coal and gasification problems with the Mellon Institute and the Carnegie Institute of Technology. Dr. Eric F. Lype, an outstanding expert on the application of kinetic theory and advanced thermodynamics to practical engineering problems, has also joined the staff of the Institute, and will participate both in the research and educational programs. Dr. Lype has recently spent two years in the Gas Turbine Division of the DeLaval Steam Turbine Co., and accordingly is well versed in the possibilities of this new development.

Other new additions to the Institute staff include M. Frank Knoy, formerly gas application engineer with the Long Beach Municipal Gas Co. Mr. Knoy will be active in the Appliances Section of the Institute's Research Division, and is expected to carry out work in refrigeration and air conditioning as well as other domestic and industrial applications. George Creelman, who has spent 11 years with the M. W. Kellogg Co., and has specialized in applications of the fluidizing technique, has become Administrative Assistant to the Director, and will be particularly responsible for the applications of the newly developed flash pulverizer to problems in related industries. A number of the most prominent men in the Gas Industry are also available as consultants to the Institute on its problems. Included in this list is Henry Loebell of New York, whose name and activities are well known to all members of the Gas Industry.

The Institute looks forward to the

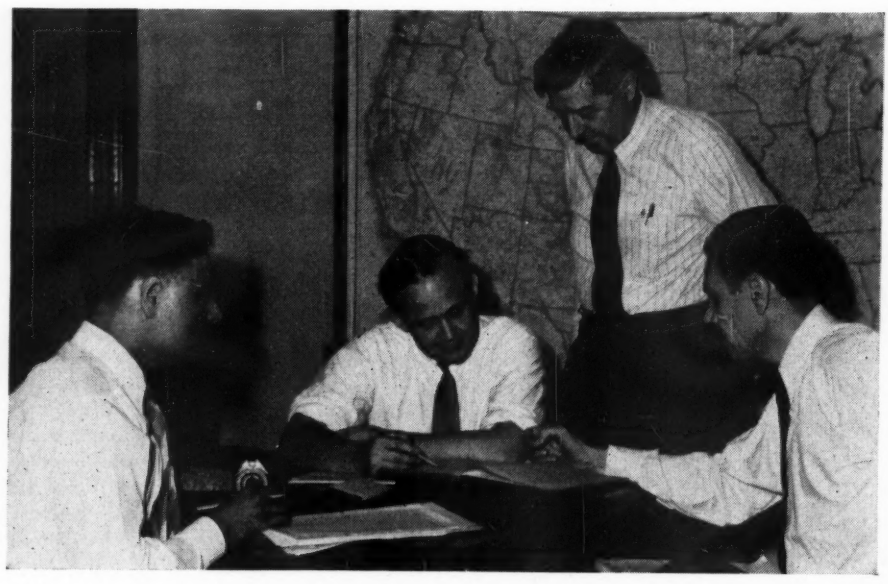

FIG. 9. Associate Director Leon J. Willien and Professor Yellott discuss the basic research program with A. D. Singh and John J. Sebastian, co-supervisors of the Coal and Gasification Section.

Gasification Laboratory

A new gasification research laboratory is being built for the Institute of Gas Technology at Illinois Institute of Technology, it has been announced by John I. Yellott, director of the Gas Institute.

The new laboratory, which will add 30% to the space available for gas industry research, will be ready September 1. Though the structure will be used primarily for gasification research, a portion will be utilized as an addition to the Gas Institute library.

Being constructed and equipped at an approximate cost of $10,000, the new laboratory bridges the space between the two present buildings of the Gas Institute, making one unit of the entire Institute. The new building is a one-story brick structure. Its 1800 sq. ft. of space will accommodate 20 research workers.

future with confidence. The building of a research and educational institution is primarily a matter of individuals, since the best equipment will be unproductive, without the wholehearted and enthusiastic support of the men and women who operate the apparatus and who utilize the facilities. Future staff appointments will be made with great care, with the expectation that such appointments will be permanent, and that those who receive them will devote much of their future careers to building up the Institute to the point where it can render to the Gas Industry the type of service which was anticipated by its founders.

The student training program will go forward with renewed vigor when the war is over, and students can again be occupied in graduate study. The Gas Institute expects to train to the highest possible level a small number of really outstanding young men, and to make these men available to the Industry, so that it can go forward in the post-war years.

The research program of the Institute will continue to stress projects which are of interest to the entire Industry. Emphasis will be placed equally on manufactured and natural gas. Applications for both will also be vigorously studied. Every modern tool of scientific investigation will be provided for a staff which will increase both in size and in competence as the Gas Institute moves ahead with the Gas Industry.

BIBLIOGRAPHY

1. John C. Kalbach, "Improving Solids—Gas Contracting by Fluidization," *Chemical and Metallurgical Engineering, 51,* 94-8 (1944).

2. H. W. St. Clair, "SonicFlocculation as a Fume Settler: Theory and Practice," *U. S. Bureau of Mines Report of Investigations,* R. I. 3400.

3. Jul. Hartmann, "A New Method for the Generation of Sound Waves," *Physical Review II, 20,* 719-27 (1922).

4. C. H. Riesz, T. L. Pelican, and V. I. Komarewski —"Catalytic Dehydration of Natural Gas Hydrocarbons," *Oil and Gas Jour., 43,* 67-9, 96, 7, (July 15, 1944).

Locating Leaks With Combustible Gas Detectors

W. R. FRASER, Michigan Consolidated Gas Co., Detroit. Excerpt from a paper, "Detectors for Locating Contaminants Encountered in Gas Production and Distribution Practice," presented before the AGA Technical Section, Joint Production and Chemical Committee Conference, New York City, June 6 and 7, 1944.

WHEN gas escapes from a buried main or service and combustible is detected in the atmosphere of a substructure or in a building, no information is given other than the fact that somewhere in the vicinity of the test there is a faulty gas conduit. In such a case, the work of locating the focal point of the leakage may be given to a so-called prospector by the survey crew.

In the method herein described, the prospector is equipped with the necessary means for locating buried metallic conduits, for making needle bar holes in the ground or street over the mains or services and with combustible gas detector equipment. Generally, both the standard combustible gas detectors and flow-type instruments are provided. With the flow-type apparatus, atmosphere from the bar hole flows by pressure through the equipment rather than being aspirated. The prospector first drives needle bar holes over the gas lines adjacent to the location where escaping gas has been detected and aspirates samples of atmosphere from the bar holes through the detector.

When the area which contains combustible gases is located by this means, more bar holes are driven to determine the points of relatively high concentrations of gas. If there is frost in the ground or the area is in a city street where there is solid concrete cover from building wall to building wall the area in which high concentrations of gas are detected may be expected to be quite extensive. In the case of the city street no unnecessary excavations should be made and it becomes desirable to exactly focalize the point of leakage.

It has been found that the flow-type combustible gas detector may be used for this purpose and become in reality a pressure gauge. (Fig. 1.) The instrument probe is fitted with a stopper that will firmly fit the bar hole. The time required for the atmosphere in the bar hold to flow through the probe and into the detector filament chamber and produce a reading on the instrument meter at the equivalent of the lower explosive limit is noted. The procedure is repeated over a series of bar holes until the location of the maximum flow point is determined. Experience has proven that the leak will be found under this maximum flow point in 95% or more of the cases.

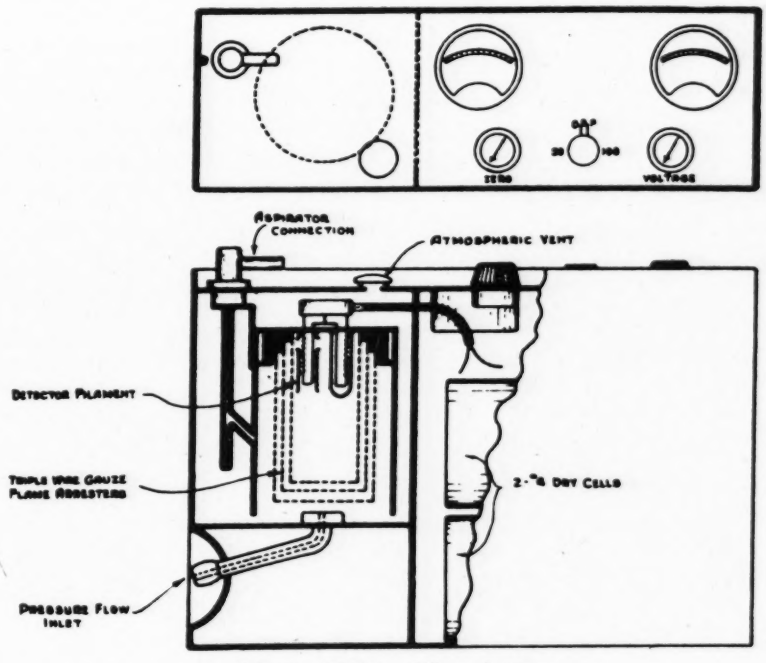

FIG. 1. Design of flow detector.

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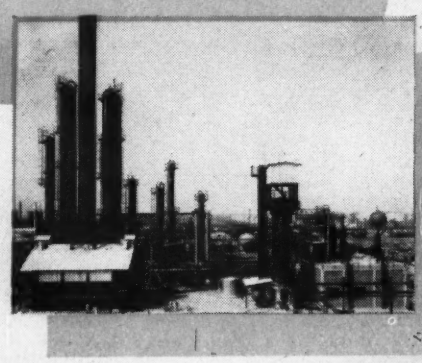

Utility Use of LP-Gas Up 20 per cent in 1943

EXPANSION in sales of liquefied petroleum gases continued their downward trend in 1943 when deliveries of 675,233,000 gals. were only 15% above the 1942 total of 585,440,000, compared with increases of 27% in 1942 and 48% in 1941. Inadequate transportation, equipment shortages, and diversion of the products as raw materials for the manufacture of rubber and high octane motor fuel were intensified in 1943, preventing distributors from supplying the potential demand in full. Table 1 gives the story of the growth of the liquefied petroleum gas industry from 1937 through 1943.

THE volume of liquefied petroleum gases used by gas companies in 1943 was 37,519,000 gals., a 20% increase over the 1942 total of 31,366,000 gals., according to a U. S. Department of the Interior report issued July 15 and prepared by A. T. Coumbe, Petroleum Economics Division, Economics and Statistics service, U. S. Bureau of Mines. These figures compare with a 24% expansion in sales to utilities in 1942.

Increasing awareness of the LP-Gas market by the gas industry is revealed in the AGA's report to the Bureau that at the end of 1943, liquefied petroleum gas was being delivered through mains to consumers in 219 communities in 32 states by 101 companies supplying 83,320 consumers.

"Butane-air gas with heating value ranging from 520 to 1300 Btu. per cu. ft. was supplied to 157 communities in 30 states. A mixture of undiluted butane and propane gas with a heating value of 2800 to 3000 Btu. per cu. ft., was supplied to 18 communities in Arizona, California and New Mexico. Undiluted propane gas with a heating value of 2550 Btu. per cu. ft. was supplied to 41 communities in Maryland, Minnesota, Nevada, New Jersey, North Dakota, Virginia and Wisconsin."

Purchases of butane by gas companies dropped from 54% of their requirements in 1940 to 40% in 1942. However this trend was reversed in 1943, when the proportion of butane in gas-company purchases jumped to 58%. The propane share in the liquefied petroleum gases credited to gas companies also followed a trend similar to that of butane, dropping from 26% of the total in 1940 to 16% in 1942 and then up to 22% in 1943. Sales of butane-propane mixtures to gas companies followed a reverse pattern from that of butane and propane, increasing from 21% of the total requirements in 1940 to 45% in 1942 and then a shrinkage to 20% of the gas-company item in 1943, as this industry turned strongly to butane and propane for "stand-by" gas.

Domestic Sales Decrease: The annual growth in sales of liquefied petroleum gases for domestic use has contracted sharply from a 65% gain in 1941 to 36% in 1942 and to only 13% in 1943—owing to supply, equipment, and transportation difficulties. Reported deliveries of liquefied petroleum gases for domestic fuel were 339,380,000 gals. in 1943 against 299,559,000 in 1942. Limited supplies and restrictions in some areas are reflected in the smaller increase in use of liquefied petroleum gases as fuel for internal-combustion engines—87,834,000 gals. in 1943 compared with 82,456,000 in 1942—a gain of 7% in contrast to a 23% expansion in 1942 over 1941. Purchases of liquefied petroleum gases for raw material by chemical plants of 55,356,000 gals. in 1943 were only 4% above 1942 requirements and compare with a 20% gain in this particular demand recorded for 1942. Sales by uses are shown in Table 2.

Emphasis on Propane: The percentage shares of the different gases making up total sales of liquefied petroleum gases changed somewhat in 1943 compared with 1942. Liquefied gases reported as butane dropped from 22% of the total in 1942 to 21% in 1943, as relatively more butane was diverted for raw material to manufacturers of motor fuel and rubber. The propane item for 1943 increased to 32% of total sales compared with 26% in 1942, a gain reflecting a shift from butane and butane-propane mixtures to propane as an industrial fuel. The rise in the propane proportion of total sales of liquefied petroleum gases was counterbalanced by a similar percentage loss for butane-propane mixtures, as "mixtures" dropped from 52% of 1942 deliveries to 46% in 1943. Pentane made up less than 1% of the 1943 total or about the same proportion as in recent years.

Unusual factors under the stress of war conditions have forced some changes in the proportions of the different gases sold for principal uses. Butane which made up about 16% of the domestic demand item in 1940 has gradually decreased to a 13% share of the total in 1943. Propane as a domestic fuel has been replaced by butane-propane mixtures to some extent. Propane delivered as domestic fuel, making up over 50% of the total demand in 1940 constituted only 37% of the domestic-use item in 1943, while "mixtures" have expanded from one-third of the domestic total in 1940 to one-half in 1943.

Industrial Uses: The respective percentage increases for the principal uses of liquefied petroleum gases varied widely in 1943 compared with 1942. Sales of liquefied petroleum gases for industrial fuel showed a greater percentage gain in 1943 than in 1942, while increases for other uses in 1943 (except the minor "all other uses") were below the 1942 rate. Deliveries of liquefied petroleum gases to industrial plants increased by 31% in 1943 (149,429,000 gals. in 1943 compared with 114,132,000 in 1942) or double the 16% gain reported for 1942.

Butane with its higher Btu content is the better fuel for industrial use;

TABLE 1. SALES OF LIQUEFIED PETROLEUM GASES IN THE UNITED STATES, 1937-43
(Thousands of Gallons)

Year	Butane	Propane	Butane-propane mixtures	Pentane	Total	
					Quantity	Percentage increase over previous year
1937	45,399	46,474	46,694	2,833	141,400	32.6
1938	52,768	54,130	56,050	2,253	165,201	16.8
1939	71,351	79,323	69,020	3,886	223,580	35.3
1940	77,056	109,216	123,348	3,836	313,456	40.2
1941	112,244	126,969	219,252	4,387	462,852	47.7
1942	128,560	150,511	301,917	4,452	585,440	26.5
1943[1]	140,122	218,273	312,683	4,155	675,233	15.3

[1] Subject to revision.

TABLE 2. MARKETED PRODUCTION OF LIQUEFIED PETROLEUM GASES BY USES (1942-43)

(Thousands of Gallons)

Use	*1943*[1] *Total*	*1943*[1] *Per cent of total*	*1942 Total*	*1942 Per cent of total*
Domestic	339,380	50.3	299,559	51.2
Gas manufacturing	37,519	5.6	31,366	5.4
Industrial fuel	149,429	22.1	114,132	19.5
Chemical manufacturing	55,356	8.2	53,038	9.0
Internal-combustion-engine fuel	87,834	13.0	82,456	14.1
All other uses	5,715	.8	4,889	0.8
Total sales	675,233	100.0	585,440	100.0

[1]Figures for 1943 subject to revision.

however, manufacturers have had to turn to propane under current conditions. Butane constituted above 47% of the LP-gas requirements of manufacturing plants in 1940 and 1941, 44% in 1942, and 38% of the total in 1943. The propane share in the industrial-fuel total has fluctuated irregularly from 47% in 1940 to 17% in 1941, 18% in 1942, and then a strong upward turn to 49% of the total for 1943, as manufacturers bought more than three times as much propane as reported in 1942. The percentage of butane-propane mixtures in sales of liquefied petroleum gases to industrial establishment, like that for propane, has changed greatly in recent years—constituting 5% of the total in 1940, 36% in 1941, 38% in 1942, and then down to 13% of total industrial-fuel requirements in 1943.

Chemical and other uses: Butane-propane mixtures make up the larger share of liquefied petroleum gases used by chemical plants as raw material, the proportion being about 88% of their purchases in 1940 and 1941 and then a shrinkage to 72% of the total in 1942 and 1943, as manufacturers of chemicals increased their purchases of butane and propane. Most of the pentane is reported as raw material for chemical plants, and this gas has ranged from 9% of the chemical "item" in 1940 to 6% in 1943. Butane-propane mixtures are used more than the straight butane and propane as fuel for internal-combustion engines and satisfied about 77% of the demand in 1940, 70% in 1941, 78% in 1942, and 84% of the motor-fuel total in 1943. Butane for engine fuel has declined from 28% of the 1941 requirements to 11% in 1943, as restrictions on its use were put in force. Propane is not used in important volume as a fuel for internal-combustion engines.

Converted Office Building Uses Gas Heat

NATURAL gas from the distributing system of the Oklahoma Natural Gas Co. will supply fuel to a modern heating plant which has been installed in the 12-story Herskowitz office building federal housing conversion unit in downtown Oklahoma City. The new system will supply the space and hot water heating needs of the occupants.

John M. Noftsger, area conversion supervisor, Home Owners' Loan Corp. says, that so far as he can ascertain, the Herskowitz conversion is the largest of its kind in the United States. The 32-year-old office structure was one of Oklahoma City's first "skyscrapers."

The building contains 76 living units, 42 of which are two-room apartments and 34 are three-room apartments, all to be furnished and heated from an American Ideal gas-fired steam heating system installed in the basement and connected to American Standard Radiators and Sanitary Corp., steam radiators, thermostatically controlled. The rooms were opened in April and May for housing of employees of war plants or essential industries.

The gas heating unit has a capacity of 2,880,000 Btu's. It is equipped with a Thermo gas valve which opens and closes the gas burners; a U. S. Gauge Co. syphon gauge, Pittsburgh Equitable Meter Co. gas pressure regulator, Ames vacuum heating pumps, and a Peerless Electric Co. one-hp. 40 rpm electric pump. Four No. 250 Lawson Booster water heating units with capacity of 280-gals. per hour each are connected to a 7100-gal. steel, asbestos-covered water storage tank, 48 ft. long and 14 ft. in diameter. Equipment connected to the boilers includes a Gould 100-hp centrifugal pump, a 7¼-hp General Electric motor, a General Electric magnetic switch, and an H-1-1½ booster pump for hot water.

When the federal authorities took over the job of converting the office building to a war housing unit, there was no central heating system in the building. The old one had worn out and been removed and the few offices which were still occupied were connected to the heating system of an adjoining building.

Southern Union To Divest South Texas District

Southern Union Gas Co. and its subsidiary Southern Union Production Co., have applied to SEC for authority to sell all interest in, and ownership and control of, properties and assets in southwestern Texas used in the operation of the natural gas system known as the South Texas district. The company seeks to acquire all capital stock of a new corporation to be organized in Texas, then sell it to the South Texas properties for $800,000. Southern Union Production Co. will assign all existing rights and interests to the new company, which will in turn purchase the properties from the two companies by issuance and sale of $500,000 in first mortgage 3¾% sinking fund bonds.

PAW Eases Michigan Drilling Restrictions

Natural gas production operations in Michigan may be conducted on 160-acre units without filing for prior approval, Deputy Petroleum Administrator Ralph K. Davies announced Aug. 11.

Under the terms of the amended order, natural gas production operators are granted authority to use critical materials in drilling gas wells in any horizon in Michigan not to exceed a depth of 1500 ft., provided that only one gas well is drilled on a 160-acre tract.

New York Connection Regulations Revised

The New York State Public Service Commission has issued regulations requiring gas utilities to install gas mains and connections within a public street to a customer's property line at their own expense.

Customers will pay only the regular charges for gas service, plus a surcharge of 9% a year on that part of the main extension in excess of 100 ft.

Derby Gas Plans Purchase

S. E. C. is considering Derby Gas and Electric Corp.'s plan to purchase Cities Service Power and Light Co.'s interest in Danbury and Bethel (Conn.) Gas Co. for a base price of $1,450,000. Derby would sell an additional $1,450,000 principal amount of 3% debentures to the Equitable Life Insurance Society of the United States and issue and sell a sufficient number of common stock shares to provide $1,000,000.

Rotary Type Compressors for Field Use

By C. H. HINTON

Superintendent of Production and Reserves, Panhandle Eastern Pipe Line Company

THAT natural gas is a declining asset has been brought out forcibly during the war period when demands for natural gas have increased beyond the source of supply in many parts of the country. With the strict regulation on the use of critical materials, it has been essential that each operator utilize the development supply to the fullest extent with the minimum requirement in tons of steel. For this purpose field compressors have a potentially important use aside from the normal compressor requirements which exist in many larger gas fields.

The problem of supply, particularly the meeting of peak requirements, commences within the formation itself. From an operating standpoint however, supply begins at the well head. In many gas fields there has been no attempt to produce the field in such a manner that approximately equal pressures will prevail throughout the field, and as a result there is often a pressure gradient existing between the high pressure area and the low pressure area which is frequently in excess of the equivalent of 50% of the virgin field pressure.

Due to the fact that gathering systems of one operator may extend through the various pressure areas from low to high, it becomes necessary to install compressors in the lower pressure areas in order to produce gas against an economic working pressure on the gathering system. The compressor requirement, therefore, calls for a one stage unit which will boost the pressure from a few pounds up to around 100 lbs. In cases where the pressure should be raised in excess of 100 lbs., it is usually a better procedure to use two stage compression.

The Gathering System: A gathering system which is designed to take care of requirements when a field is comparatively new does not often take into consideration the variance in the pressure decline which may occur at a later date. For this reason it is often necessary to overcome the pressure condition which has been created within the field by the installation of compressors on the pipeline system.

Selection of Compressor Location: The location which is selected for the installation of the compressor is of course dependent upon the original design of the gathering system. Pressure trends within the field should be carefully studied and the cost of installing and operating the units will influence the decision of whether it is cheaper to install individual units handling comparatively small volumes or to revamp the existing gathering system and go to a semi-decentralized system of compression.

The gathering system should be checked for "bottlenecks" for in some instances the required working pressure at the well head can be lowered a few pounds by pipeline changes rather than by the installation of the compressor unit. Regardless of how much care is taken in studying the trend of the fields and the possible revamping of the gathering system, there will be some isolated cases where the situation can best be handled by the use of a compressor, and the pressure requirement may be only a few pounds above the pipeline working pressure and may run up to the economical limit of the unit itself.

Selection of Unit: The size of the compressor to be insalled is dependent on the volume of gas to be handled and the operating pressures required. The ability of a well to deliver gas at the required range of operating pressures and the prorated allowable of the well determines the size of unit to be installed. The well deliverability can best be obtained by back pressure open flow test curves. This not only enables the operator to determine what volume of gas will be handled through the compressor in the immediate future, but also enables a rather definite determination of what will happen as the closed-in pressure of the well declines further.

The Rotary Type Compressor: The use of rotary type compressors is rather common around refineries, and it has been found that they do their work quite successfully in the lower pressure ranges. It was on the basis of the operating record of the units working at low pressures that a decision was made to try the rotary type compressors on two individual wells in the Panhandle Field of Texas. The rotary compressor which was selected is manufactured by the Fuller Co. of Catasauqua, Pa. Fig. 1 gives a diagramatic sketch of the gas compressing end of the unit.

The Fuller rotary compressor is of the multi-vane type. The intake and discharge openings are located in the horizontal plane on opposite sides of the cylinder which avoids the reversal of the gas flow and simplifies the required piping. The absence of valves, or other involved parts requiring frequent attention, adapts these machines particularly well for continuous service. The steel rotor is accurately machined with integral shaft. It is arranged eccentrically within the cylinder on the same vertical center line, and the shaft is supported on radial roller bearings in each of the heads. Composition blades are arranged to slide freely within milled slots in the rotor, the blades being forced outward during rotation solely by the effect of centrifugal force.

The eccentric mounting of the rotor within the cylinder forms a free space, crescent shaped in cross section, divided into compartments by the blades. The volumes of these compartments vary from minimum to maximum on the intake or suction half revolution and from maximum to minimum on the remaining, or compression, half revolution. The large number of compartments afforded by the multiplicity of blades maintains high efficiency and reduces wear by minimizing pressure differences between adjacent compartments.

Effective lubrication is supplied by force-feed to all parts within the cylinder. A thin film of oil is formed on the cylinder wall to provide running surface for the blades which are bevel-

IN THE April, 1937, issue of GAS, page 42, there appeared an article, "A Discussion of the Sliding Vane Type Rotary Gas Compressor," by H. W. Walters, Allis-Chalmers Co., Los Angeles. That article described the general construction and operating principle of this type of compressor. The present article by Mr. Hinton gives the details of the successful employment of such compressors for field use in pressure boosting in natural gas gathering lines systems, where ease of installation and low maintenance cost are particularly advantageous.

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Walworth's *complete line* of bronze valves, a number of which are illustrated above, includes types designed to fit every service where bronze valves are required. Strict laboratory supervision of the physical, chemical, and metallurgical properties of the materials entering into all Walworth products is supplemented by continuous inspection of the manufacturing operations, both as to accuracy and quality of finish, and by rigid final inspection and testing of each individual product.

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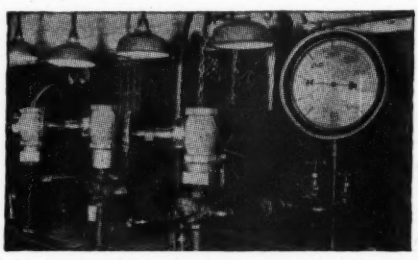
Testing Seats of Bronze Valves



Assembled bronze valves are subjected to test under pressure—either air-under-water, steam or hydraulic. The hydraulic seat test is shown here. Walworth Quality Bronze Valves undergo a hydrostatic shell test of three times their rated working steam pressures.

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ed on the leading edge to an angle sufficient to maintain this film to all blade positions.

In the event it is desired to maintain constant suction pressures, this machine can be equipped with by-pass expander pocket with automatic control which will accomplish this. The expansion pocket is built in the suction lip of the machine and utilizes the by-pass gas through re-expansion, thus eliminating any cooling of the by-pass gas.

The prime movers are direct drive, combustion type engines which use natural gas as fuel. The compressors have not been cooled with water as it has been found that when working at no greater differential than 120 lbs. the unit does not heat above a safe operating temperature. Unless an overload is placed on the engine, the regular radiator furnished with the engine is adequate for cooling. It is recommended that units be selected with capacities slightly in excess of actual requirements as they can be operated at a slower speed for the same volume of gas compressed.

Method of Installation: The piping requirements for this type compressor are comparatively simple and they can be placed directly over an existing line with a 4-in. riser which can be swedged to 2-in. at the top of the ground, and two 2-in. plug valves placed on the horizontal run—one on the intake side and one on the discharge side of the compressor—will place the unit in operation.

Due to the high speed of the compressor and the fact that the composition blades can be broken if any large quantities of liquid are carried through the run into the compressor, it is important to see that precautions are taken to eliminate the liquid from the gas stream before it reaches the intake side of the compressor. On the first two units which were installed in the field, mist extracters or moisture pots were installed on both the intake and discharge side of the unit. After several months' experience, it is believed that these are not necessary, provided there is a drip on the line close to the point where the intake riser leaves the existing pipeline.

The compressor and engine are mounted on skids to form a unit and, while it has not been tried to the author's knowledge, there is no reason why the compressor could not be coupled to existing pipelines with flexible tubing and the unit itself mounted on wheels so that it could be readily moved from one part of the field to the other and thus be used to serve more than one low pressure

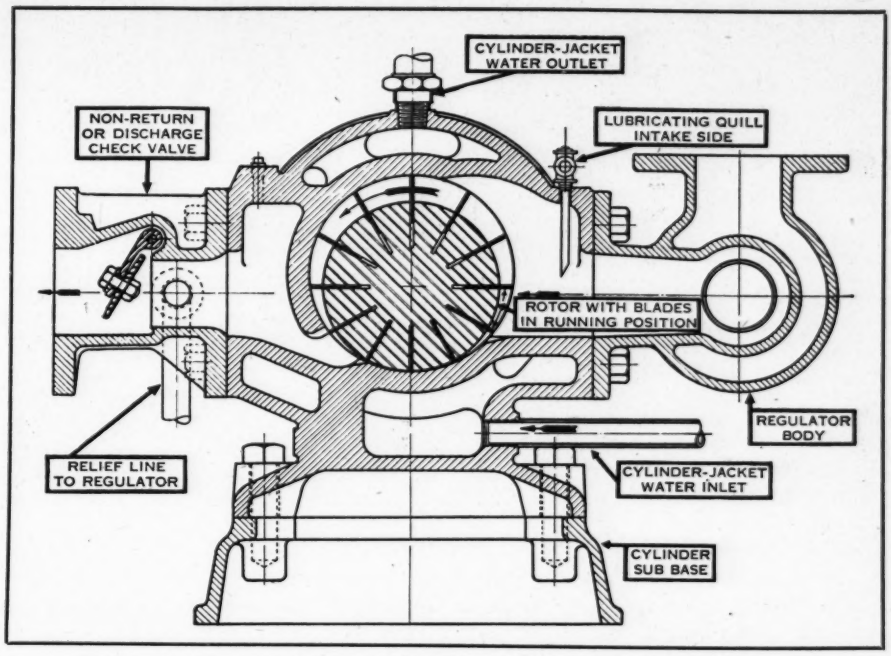


FIG. 1. Diagramatic sketch of gas compressing end of rotary type compressor.

TABLE NO. 1

	Unit No. 1 *No. Hours Operated*	*Unit No. 2* *No. Hours Operated*
1942	6,217	6,943
1943	6,357	3,031
Total	12,574	8,974

Volumes of Gas Compressed Mcf at 30 in. Hg. Sat.

	No. Hours Operated	*No. Hours Operated*
1942	296,712	171,831
1943	286,946	75,616
Total	583,658	247,447
Per 24 Hours	1,114	662

Operating Speed

1200-1400 rpm	1200-1400 rpm

Lubrication—Quarts of Oil

	Engine	*Compressor*	*Engine*	*Compressor*
1942	223	147	311	129
1943	172	148	158	71
Total	395	295	469	200

Fuel Used—Mcf Natural Gas

	No. Hours Operated	*No. Hours Operated*
1942	1,818	1,700
1943	1,771	867
Total	3,589	2,567

Man Hour Requirements

	Servicing Units *Engine*	*Compressor*	*Servicing Units* *Engine*	*Compressor*
1942	335	178	291	232
1943	408	354	328	169
Total	743	532	619	401

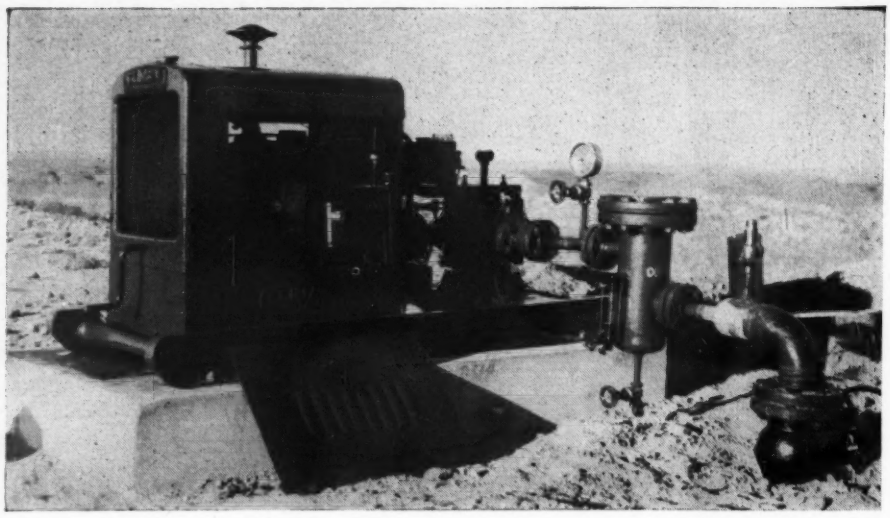


FIG. 2. Complete unit in field use.

well. This is of importance from a proration standpoint. Fig. 2 shows a complete unit in field use.

Servicing of Unit: The routine operation and maintenance of the rotary compressor is taken care of by a chart changer on his regular chart changing trip.

It is believed that the compressor will run approximately one year without a major overhaul. The length of the period between overhauls on the engine is dependent upon the original quality of the engine and also on how much of an overload the engine has been forced to carry.

Maintenance is taken care of by dismounting the unit from its concrete foundation and hauling into a machine shop by truck. This is not a difficult operation as the entire unit is not of great weight. The compressor itself can be handled very readily by two men and hauled in the trunk of a regular passenger car.

Service Records of Units Previously Installed: During the late fall of 1941 two rotary compressors were installed on wells located in the Panhandle Field and are designated as Unit No. 1 for the Burnett 1-108 well and Unit No. 2 for the Bivins 1-91 well. These units are both installed approximately 100 ft. from the well or far enough away so that any repair work needed on the well will not require the moving of the unit.

Unit No. 1 has operated with an intake pressure of approximately 220 lbs. gauge and a discharge pressure of 330 lbs. gauge, and the Model C-11, Fuller rotary compressor powered with Lycoming engine will compress approximately 700 Mcf per 24 hours.

Unit No. 2 is also a Model C-11 powered with a Ford, 8 cylinder engine and operates with an intake pressure of approximately 265 lb. gauge and a discharge pressure of approximately 330 lbs. It will compress approximately 1000 Mcf per day.

The operating record of the two units is outlined in Table No. 1, which gives volume of gas compressed, operating speed, lubrication requirements, fuel used, and manpower needs.

The man hour requirement shown would vary with conditions. In the major gas fields if a special employee was used to service the units, the driving time would amount to more than the man hour requirement for actual servicing.

Conclusion: The experience obtained from the operation of the rotary type units, which have been used approximately 2½ years, has been satisfactory. At the present time we have on order, pending final approval of all necessary governmental agencies, the purchase of three additional units, size C-15. This size unit will operate at about 1200 rpm.

It is believed that the rotary type compressor has wide possibilities for natural gas field use. After additional experience has been gained it is felt that certain improvements can be made in the compressor which will enable a wider range of speeds, especially lower speeds. This can be accomplished by weighting the blades or by installing some pusher behind the blades so that each pressure chamber which is formed when the blades are extended can be more completely utilized. Electric powered units can be made almost completely automatic so that the unit will start or stop as desired under various required pressure conditions. It is probable that this type of unit could be used to advantage at town border or distribution systems in large cities.

Laboratories to Resume Annual Inspection Trips

The American Gas Association Testing Laboratories are preparing to make annual inspections of approved gas appliances at the premises of manufacturers, according to an announcement by Director R. M. Conner. Inspection trips will start on or about October 1. Approval of equipment found on examination in the field to comply fully with Laboratories' records of approved models will be renewed for the year 1945.

While inspection activities have been curtailed due to wartime conditions, they are expected to increase rapidly as the war in Europe comes to a close. Every effort will be made to render the speediest possible service to all manufacturers.

This year the factories of approximately 170 manufacturers will be visited to inspect production models. Ample advance notice of visits will be given manufacturers so that mutually satisfactory arrangements can be made.

In addition to factory visits, inspections will be made in warehouses where gas appliances are stored, in department stores and on dealers' sales floors. Visits are also occasionally paid to consumers' homes for the purpose of checking not only individual appliances but their installation as well.

Change of Owners Approved For Louisiana Utility

S. E. C. has approved Southwestern Public Service Co.'s sale of Gulf Public Service Co., which operates electric, gas, water, ice and bottling properties in Louisiana, to Glenn C. Hyde, president of Louisiana Public Utilities Co., Inc., a non-affiliate. Hyde will pay $5,660,000 for the securities—$2,800,000 principal amount of unsecured notes and 3000 shares of $100 par common stock, and proposes to sell 62½% interest to C. W. Murchison, Dallas, and 25% to Frances H. Lattner, Fairfield County, Conn., retaining 12½%.

Gulf will refund its presently outstanding $2,500,000 principal amount of 5% unsecured notes by sale of a like amount of notes or first mortgage bonds with an interest rate of not more than 4¼%. Proceeds will be deposited with trustee for the indenture securing Southwestern's first mortgage and collateral trust bonds.

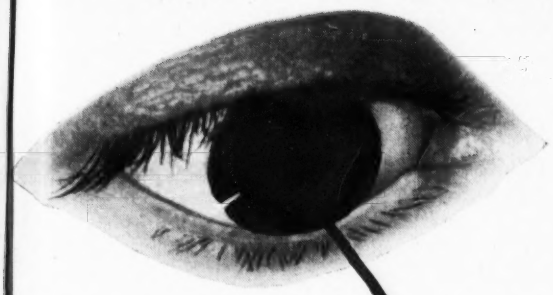
Oklahoma Wells Restricted

In an order issued upon application of Walker T. Pound, conservation officer, the Oklahoma Corporation Commission has restricted production from wells making gas only in the West Cement, Medrano pool to 23,626,000 cubic feet per day.

The order states that anticipated demand from the lower Charlson sand of the Chickasha field during August, is 6,129,000 cubic feet per day.

UGI Sells Manchester Shares

United Gas Improvement Co. has sold to the Manchester (New Hampshire) Gas Co. 840 shares of Manchester 7% $100 accumulative preferred stock and 4200 of $100 common stock for $33,000, in compliance with an SEC order of 1942 directing U. G. I. to divest itself of holdings in a number of companies, including Manchester.

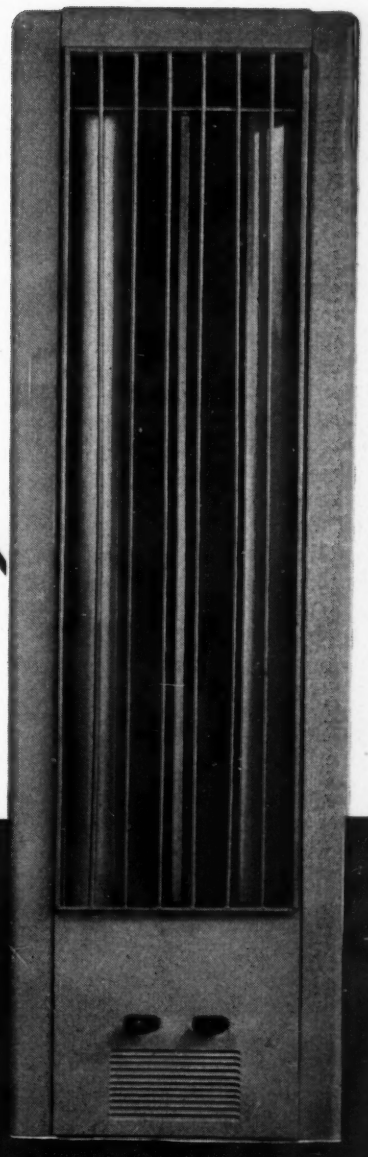


A GREAT NEW CONTRIBUTION TO THE GAS INDUSTRY

The new vented PANELRAY heater radiates infra-red heat rays into every corner of a room at the correct height to warm the "living zone."

Here is an efficient heater which can be installed upstairs or down — uses no floor space and all portions are at, or above, floor level. They are made in three sizes, 10, 20 or 30,000 B.T.U., in single units; duals in various combinations of these three.

Write for illustrated booklet.



"THE NEW SYSTEM OF HEATING"

PANELRAY

APPROVED BY THE AMERICAN GAS ASSOCIATION

A Product of

DAY & NIGHT MANUFACTURING CO.

MONROVIA, CALIFORNIA

Manufacturers of "America's Finest Water Heater"

HOME SERVICE

Canning "Chalk Talk"

HOW colored chalk put warmth into a "cold" cooking school is the story of Home Canning Chalk Talks sponsored jointly by the Pacific Gas and Electric Co. and Standard of California. Marguerite Fenner, appointed Director of Home Economics for the P. G. and E. at the beginning of this year, had already successfully conducted "cold" canning talks in the Sacramento Division of the company in the summer of 1943. Faced with the responsibility of planning home canning meetings for a large part of the company's territory, she called in Bernice Redington and Chalk Talks were launched forthwith.

For years chalk talks have been used for all sorts of salesmanship in the back rooms of utility offices, reasoned these two home economists, so why shouldn't housewives be initiated into the mysteries of home canning by this same method?

Miss Redington has a combination of journalism, fine arts and home economics in her education, with a degree from the University of Washington; excellent experience as a home service director, and a passion for barnstorming wtih fruit jars in her hand. She has also done work in food preservation as a research assistant in the Fruit Products Laboratory at the University of California under the direction of Prof. W. V. Cruess.

Here are the practical, physical aspects of the demonstration.

One small, privately owned business style coupe was the only transportation available. Into this were packed three dozen assorted home style jars of fruit, vegetables and relishes. A turkey roaster, to illustrate baking chili sauce, a former preserving kettle to show a makeshift water bath, three pieces of oven glass to suggest baking jams, a jar lifter (the only model available in stores), a wooden spoon to remind women that wood carries mold infection, a pair of asparagus tongs, a set of colored measuring spoons (for color), and a pressure cooker were the only utensils shown.

Laundry being out of the question when five towns were covered each week, a roll of newsprint bought from a country paper was stored in the car and unrolled across long tables before the jars and other props were unpacked. Standard Oil colored vegetables were pinned or tacked on the edge of the table making a speedy, colorful and suitable trimming.

Since a blackboard was too large to carry in the car, white sheets of paper were tacked up when no blackboard was available, and colored crayons used instead of chalk.

Actual sources of the chalk talks were the questions which Miss Redington knew the women would ask—and many housewives testified that they never actually understood the reasons for canning by new methods before they saw the illustrations. Sample questions and answers were:

Why do my apricots float to the top of the jar?

Because there is air inside the fruit tissues; illustration: An apricot with water wings floating on waves of blue chalk. Remedy: Hot pack the apricots instead of cold packing, and use the boiling water bath, not the pressure cooker.

Why do my cold pack pears turn dark in the jars?

Because there is an enzyme which speeds up the darkening and it takes place before the fruit gets hot through. Remedy: Hot pack the pears, then process in the water bath. Illustration: A small boy running a lawnmower might get the grass cut eventually; his mother leaning out the window reminding him of the joys of swimming when he gets done, is an enzyme because she doesn't do the job but speeds it up.

Next come "Three Bugs in a Tub," which are Yeast, Mold and Bacteria. These were fittingly illustrated as Bugs of gradually increasing unfriendliness, requiring gradually increasing temperatures (that is almost boiling water, boiling water and steam pressure) to kill them.

The picture the audience liked best was a green bean lolling in an easy chair, to illustarte exhausting the air from jars of vegetables before processing in the pressure cooker.

Why customers of the P. G. and E. are asked not to practice oven canning or teach it to their young neighbors is shown by drawing an oven containing a sponge cake, then marked with 250 degrees F., and a fruit jar added. This the audience admitted was not very hot for the pink chalk hand which is sketched in quickly. Next a teakettle is drawn and marked 212 degrees F., and a pink chalk hand goes into that; this is a familiar experience to the women, and when a fruit jar is sketched into the teakettle, they admit it would get hot pretty fast.

Every home canning question can be answered with a sketch of some familiar situation, says Miss Redington. Her theory is that the women who do the most home canning are those who married early, produced large families and must live on small incomes. The brides in bobby socks, now raising a bumper crop of babies are marking time until the war is over and they can start out with their returning veteran husbands to settle on farms and cattle ranches 25 miles from a store. They'll be the home canners for the next 20 years; therefore by simplifying home canning information, the standard of living can be raised without any burden of taxation because it becomes a "help-yourself project." Two-dollar words like "closure," "optimum," "spoilage organisms" and other confusing terms belong in the research laboratory, not around the lard bucket which is being

Bernice Redington goes into action at a home canning "chalk talk."

used to give the tomatoes a boiling water bath.

Some good practical glamour in the form of relish novelties were included in the display such as watermelon pickles, English style pickled walnuts, pickled cantaloupe and marashino cherries. Each demonstration ended with a plea to face reality in the fruit jar, discard what appears unsafe to eat, and can only with methods known to be safe for California. Fifty-three of these meetings were held. There were no door prizes, no refreshments; and in spite of gas rationing, the women turned out and said it was well worth the hike.

In Hawaii

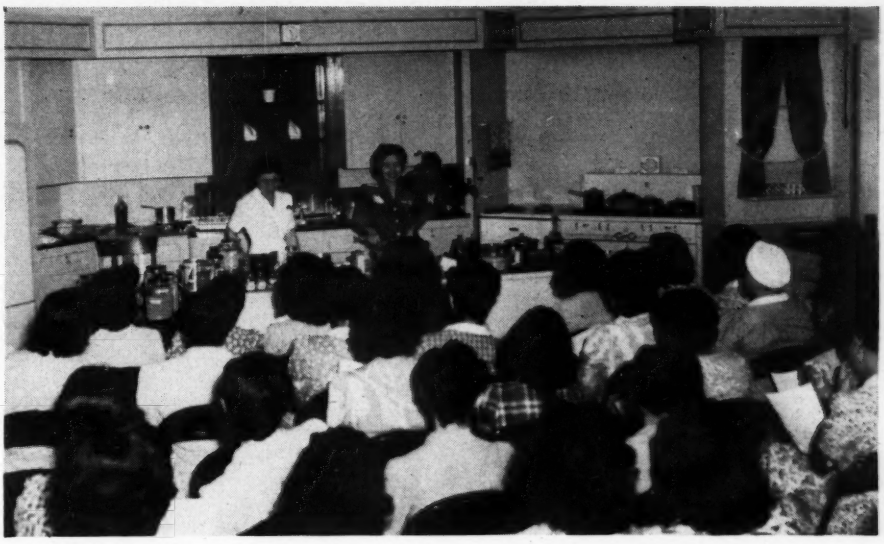
Ever since December 7, 1941, the Home Service Department of the Honolulu Gas Co., Ltd., has been called upon to assist with the local nutrition program. The department, under the direction of Jean Robinson Weir, instructs housewives in ways and means of prolonging their present gas appliances, as well as aiding the general public with all food problems which this war has brought upon Hawaii.

Where foods are concerned, reports Home Economist Joan Shimamura, prior to that December day, the Islands had been dependent upon mainland importation. Because shipping from the mainland to Hawaii was naturally curtailed by the war, island housewives immediately cooperated by producing their own foods through Victory Gardens wherever space was available.

Stress was laid, through classes, newspapers, radios, and window displays, upon the "basic seven," so essential to good health, especially under the changed mode of living under blackout conditions, with more confinement indoors and less ventilation.

Doctors, nurses, and hospitals in this central Pacific war area were taxed to the utmost, and upon the housewife's shoulders rested the responsibility of keeping her family strong and healthy, in order not to impose upon the doctors and hospitals.

Since so much of the meat supply is sent to the armed forces, the home front had to resort to meat substitutes. Since January of 1943 the Home Service Department has been active in promoting soybeans as a meat substitute, and have through classes, the press, radio, and Victory Garden shows, stressed the importance of soybeans as food. With the helpful cooperation of geneticists of the Hawaiian Sugar Planters' Association, the planting of soybeans in all available land to alleviate the meat shortage was encouraged. Coping with current food problems has not been the only task of the department. According to Mrs. Shimamura, they have also been called upon to contribute to the island's "Americanization" program.



Mrs. Joan Shimamura, home economist (right), conducts home service class for Honolulu Gas Co. Miss Ruth Talcahashi assists in the demonstration.

Because the Territory of Hawaii is composed of a large percentage of Orientals, many of whom cannot speak English fluently, introduction to and inculcation with the American way of living has been one of the department's responsibilities. In classes in their Home Service kitchen, they often demonstrate table etiquette, as many of the people have not yet adopted American table service. The cooking of foods the American way—preparing a complete oven meal, for instance—is a novelty to many.

An interesting example of teaching by indirection was the Thanksgiving program held on November 4, 1941, just prior to the blitz, when 120 persons of all races watched a demonstration on stuffing and roasting a turkey. There were not enough seats, and the doors were blocked by women and children anxious to learn the complete preparation of a Thanksgiving dinner. Observing Thanksgiving day with reverence is strictly an American tradition, and the new generation here have come to appreciate more and more early American history, and to know the true meaning of being citizens of a democratic nation.

To manufacturers of gas appliances it is pointed out that after the war, Hawaii may well become one of the world's greatest naval and air bases. More men will be sent there and many of those now in the armed forces will make their homes on the island. More and more improved gas appliances will be needed in the kitchens of Hawaii's ever-increasing population.

Canning "Clinic"

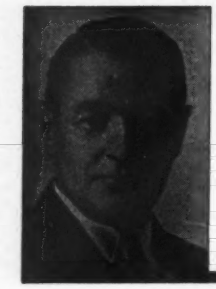
Women busy with war and home duties have little time to attend lectures on home canning—so Miss Flora G. Dowler, home service director of the Manufacturers Light and Heat Co., Pittsburgh, and affiliated gas companies, remedied the situation with a modern canning "clinic."

Under her direction, canning clinics are being held in all eight districts served by the gas company. These are held not in halls or schools but in the gas company offices or in the stores of gas appliance dealers, who are cooperating enthusiastically.

The canning "clinic" is an informal arrangement by which information and canning materials are gathered and placed for inspection by busy women who have only a few moments to spare and who may need guidance only on one or two points. They may be experienced canners otherwise who are hazy only on those points.

To these clinics come women who have home-canned for years, but not with wartime materials. They may have followed wrong methods in some respects. Or they may be young women, whose husbands have gone into the army or navy, and who have never done any canning. If they are living at home until the war ends, they want to find out how to do all these things correctly against the day when peace comes and their personal war hero comes marching home.

Gas appliance dealers in most of the towns served by the gas company find that the canning clinics are a new way in which they can be of service to women of their neighborhoods. They like the idea and have freely lent space in their stores for the clinics, which are held on specific dates and at certain specified hours.



POST-WAR NOTES and NOTIONS

By STANLEY JENKS

The New AGA Ads

ACCORDING to *The Wall Street Journal*, the National Association of Home Builders, which has a membership of approximately 6000 local builders, has hired Steve Hannegan, the dean of press agents, to debunk the "dream home" complex which is plaguing the minds of the citizenry, following exposure to the "plastonic" plausibilities of anamorphous advertising.

The gas industry has not been entirely guiltless in this respect. It will be a long time before many of us can hope to forget "the 1943-44 campaign of fantasy."

The new series, announced by Carl Wolf and his AGA Committee on National Advertising, looks better—much better, and if kept within the bounds of the copy platform, will certainly achieve some constructive results, if adequately supported locally.

At least, the National Association of Home Builders cannot say that we are embarrassing them. In fact, they should feel we are really helping them, in creating a demand for better homes, better primarily because they are gas-served.

Obviously

IF THERE is anything in the post-war world as plain as your or my nose on your or my face, it is the intensity of the competition to get our load away from us.

The electric lads are not fooling when they announce their intention to raise the present domestic usage from 1100 kw. hrs. annually to 5000 kw. hrs. in the five-year period after the war. They have, or will have, the available capacity, and they have, or will have, practically every retail outlet from specialty stores to drug stores lined up to help them and their manufacturers to do it. Every alert gas merchandiser must surely realize what this means.

To raise their domestic load to an average 5000 kw. hr. annual consumption calls for the sale of around 5,500,000 electric ranges, 3,000,000 electric water heaters, and 11,000,000 electric refrigerators, over and above the toasters, flatirons, radios, and small motor-driven appliances that will be sold. While there have been times when I have suspected some individuals, I have yet to meet a real ostrich in the gas industry. We know what the majority of these 5,500,000 electric ranges and 3,000,000 water heaters, *if sold*, will be at our expense. And the attempt to sell them will not be limited to somebody else's territory. There will be no exemptions in this campaign.

In the past, the gas industry, generally speaking, has chosen to take on all comers, friend and foe alike. We have talked about dealer cooperation with a slick tongue in an unsmacked cheek. We became very adept at bribing organized dealers to let us do the job ourselves, that is, when it seemed impolitic to tell them to go to hell.

However, the day is coming soon when we, like our electrical friends, are going to have idle capacity. Has any straight gas company, big or little, manufactured or natural, figured out how many gas appliances will be needed on the system to fill that capacity? And better still, has any gas company set a time goal to double its present average domestic load with a dealer-utility team set-up that will be sure to click? If it has, the whole industry, besides myself, would welcome the details.

Lower Production Costs

THERE are several "musts" in the gas industry, the first and foremost of which is that management run it at a profit, while maintaining adequate wage and working standards for all engaged in it.

Our guest editor this month, Elroy Payne, who is as practical as they come, writes of by-product recovery in the manufacturing field as a prime essential in maintaining the industry as a going concern. The practicability of by-product recovery has been firmly demonstrated at Portland. As E. L. Hall, vice president and chief engineer, Portland Gas & Coke Co., has stated elsewhere, this is indeed a chemical age, demanding ample supplies of olefins and aromatic hydrocarbons, and we—or most of us anyway—blithely pump these into our distribution systems and waste them.

Elroy Payne quite rightly deplores this wanton prodigality, because they are national resources and should not be dissipated, because they represent real wealth, and furthermore their presence clutters up the distribution system, thereby reducing its capacity.

Prodigality with natural resources has always been an American characteristic. So long as this was a land of plenty, apart from others, flowing with milk and honey, I suppose it was cheaper to destroy (e.g., dust bowls, timber lands, water sources) than to conserve and repair. But this large-scale war, in which we have shot away in three years more wealth than we can hope to create in the next 50, has created a condition which demands conservation. The world has grown too small to allow us ever again to build tariff walls around our economy to protect our wastefulness.

Competition—and the forthcoming battle of the fuels, which will be no ring-around-the-roses party—will force us to give the customer more for his money.

Director R. M. Conner, of the AGA Testing Laboratories, tells us of the development of a 100% primary air burner, which offers very attractive utilization possibilities.

The Institute of Gas Technology is training chemical researchers who should prove powerfully influential in the industry eventually. Let's hope it is not too little and too late.

the future be like . . . and WHY?

DISCUSSION NO. 7

Flared Fittings or Compression Couplings?

. . . wise manufacturers will make the right choice!

When the automobile industry was young, compression couplings for tubing connections were the rule.

Today the industry uses flared fittings . . . and we predict the gas range industry will follow suit. The reason may be found in these simple facts:

1. The flared type of fitting is superior for gas range use because it guarantees full capacity of the tubing—there is no danger of the tubing being crushed during assembly. The flared fitting can be assembled and disassembled many times without damage to the tube and without the connection leaking.

2. On the other hand, after a compression coupling has once been tightened it may be impossible to use it again because the tubing has been crushed—making a gas-tight seal difficult, if not impossible, to obtain.

Weighing these facts, it would seem that flared fittings should definitely be standard construction on the Gas Range of the future.

HARPER-WYMAN COMPANY

8562 VINCENNES AVENUE
CHICAGO 20, ILLINOIS

ARMY E NAVY

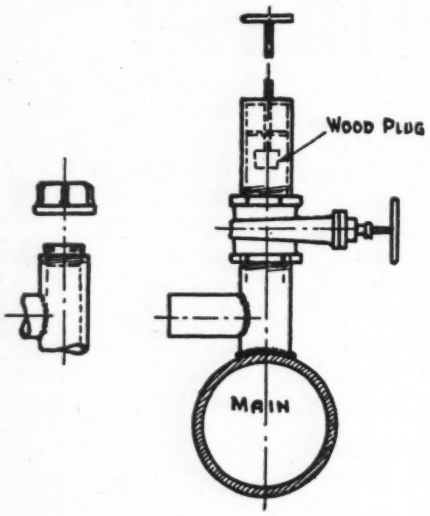
HARPER BURNER SYSTEM

2-burners-in-1

OPERATING IDEAS

Steel Tees Control Pressure When Making Hot Taps

The tee is connected to the main either by welding or with a service saddle. The new connection is tied into the branch of the tee before the hole is drilled in the main. The

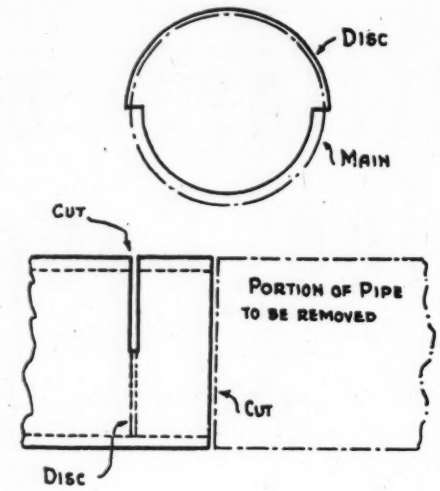


drilling is done with a machine, and through a gate valve.

The wooden plug is inserted in the top of the tee with a plugging device working through the gate valve. The plug is made tight by striking the handle of the plugging device a blow with a hammer. The plugging device and gate are removed and a screw cap installed to complete the operation.

Discs for Pressure Control on 3 in. and Smaller Mains

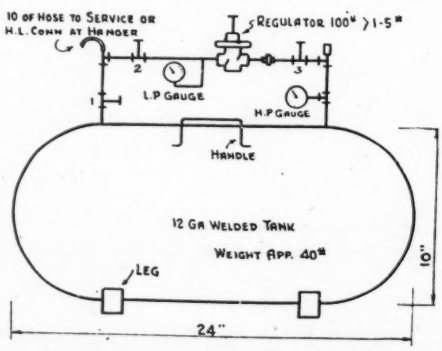
The perimeter of the top half of the disc is made to fit the outside and the other half to inside circumference of the pipe. A slot is cut in the pipe, with a one-wheel pipe cutter, slightly more than one-half of the circumference, at the point where the pressure is to be controlled. The slot is cleaned and enlarged by sawing with a hacksaw. The disc is inserted in the slot and forced in place by light strokes with a hammer. When the large part of the disc conforms with the outer circumference of the pipe, the smaller part bears against the inner circumference of the pipe, forming a satisfactory but not complete shutoff. If the pipe is to be dead ended, the disc may be left in



place and covered by a compression cap. If a tie-in is to be made, the pipe is cut about 1¼ in. from the disc. A compression coupling is loosely installed with one gasket bearing on the end of the pipe. The disc is then removed and the coupling placed in position to cover the slot. This device has been used to 3 in. and smaller pipe with pressure up to 20 lbs.

Pressure Tank for Testing Services and House Piping

This tank is used by meter men and complaint men to test service lines and customer house lines. Usually a man working alone cannot use the conventional pump, due to the

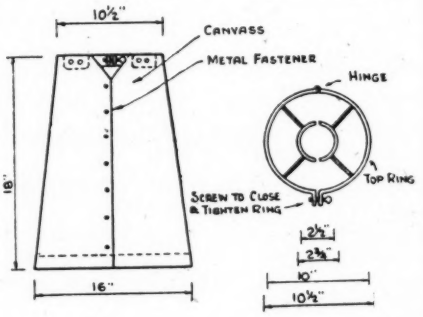


THE ITEMS published on this page appeared in AGA's "Report of Subcommittee on Wrinkles," W. R. FRASER, Michigan Consolidated Gas Co., Detroit, Chairman. This report is a part of the AGA Technical Section's Chemical Committee report, V. J. ALTIERI, Eastern Gas and Fuel Associates, Everett, Mass., is chairman of the Chemical Committee.

fact that the line being tested cannot hold the pressure long enough to allow the single man to search for leak in line. By having tank full of high pressure air and hose connected to outlet side of meter bar with valve No. 1 closed, No. 2 open, No. 3 open, and regulator set to feed desired test pressure—usually 1½ lbs., then man can examine lines for leak. This regulator will maintain even pressure on a house line and will maintain pressure for considerable time, depending, of course, on the length of line being tested and also the extent of the leak. This tank can be used also as a supply of air to clear piping by closing No. 3 valve—close No. 2 valve—connect hose to section of line to be cleared, and by opening valve No. 1 high pressure air can be used for purpose of blowing rust or water from line.

Canvas Hood for Paving Breaker

This hood is designed to fasten tightly to the paving breaker just above the point where the chisel is



inserted into the breaker. It consists of a top ring of design as shown and a closed metal bottom ring of ¼ in. steel rod. Canvas is attached to these two rings by means of metal fasteners as shown. A hood of this type with the large open top ring allows sufficient vision and it does a much better job in eliminating flying concrete than a canvas barricade.

Purging of Distribution Mains

When distribution mains are put into, or taken out of, service a simple method of purging to prevent gas and air mixing is to separate the two with a plug of CO_2 gas from 50 lbs. CO_2 cylinders. Depending on the size of main to be purged, 500 to 1500 cu. ft. of CO_2 is used. The CO_2 plug will prevent any mixing of gas and air during the travel through the main when the main is purged. The velocity of the purging gas in the main should be relatively high.

CORROSION AND PROTECTION

Of Buried Metallic Structures

Compiled and Abstracted by GUY CORFIELD, Technical Editor, GAS

3. Pipe Coatings

Wax and Grease Type Pipe Coatings

D. R. HISKEY, chemical engineer, Dearborn Chemical Co., Chicago, Ill. From a paper, "Performance of Wax and Grease Type Pipe Coating Materials."

THROUGH scientific research, pipe line engineers are aware of the value and necessity of applying protective coatings to metallic underground structures. A great deal of research has been carried on by Governmental agencies, private corporations, and individuals, and the results of these critical and exhaustive investigations or experimentations have been published and made available to engineers and others who are interested in the preservation of metallic underground structures.

It is not the purpose of this report to go into the details of protective coating formulas, for it is agreed that the prime purpose of a protective coating is waterproofness; that is, the ability of a material to retard moisture penetration.

Many types of protective coatings are in use today, used by themselves, or in combination with reinforcings or wrappers. Generally, the heavier types of protective coatings are used at so-called "hot spots," where severe corrosion is encountered.

Pipeline coatings can be classified into two main groups; namely, the hot applied enamels, and the softer wax and grease type coatings. This report is confined to the softer wax and grease type coatings.

Characteristics Compared

It might be well, by way of introduction, to compare some of the physical and chemical characteristics of the two groups or types of coating materials. The hot applied, high melting point enamels are composed mostly of coal tar or asphalt bases, primarily residual by-products. Before these basic materials or bases can be used, they must, in many instances, be reworked and other compounds or materials added. Generally, the base materials are of too low a melting point for practical use, and fillers must be added to raise them and to give body or viscosity to the material. In the coal tar base products, the melting point will vary from possibly a minimum of 180° F. to a maximum of 250° F., and penetration at 77° F. will vary from 0 to 10.

A wider range of asphalt base enamels are produced. The melting points vary from a minimum of 160° F. to a maximum of 220° F., and penetration at 77° F. varies from a low of about 10 to a high of around 25 to 30.

The water absorption properties of coal tar and asphalt vary. There seem to be some differences of opinion on this subject, but tests conducted by the writer and others indicate that asphalt has a higher rate of absorption.

The wax or grease type coatings have certain characteristics which make them very applicable for pipeline protection. It is true that their melting points, or, correctly speaking, their softening points, are considerably lower than the asphalt-coal tar materials. However, it is possible, by proper blending, to produce products which meet all the requirements of a good pipe coating. The softening points of the lighter consistencies vary from 115° F. to 135° F. Of the heavier consistencies, which are of the wax base type and generally applied hot, the softening point varies from 125° F. to 170° F.

The water absorption properties are extremely low because of their natural wax base. The dielectric strength is high and consequently shows high electrical resistance. The base materials are refined petroleum products, and do not contain high percentages of unsaturated hydrocarbons.

These wax or grease type coatings, which can be spoken of as semi-plastic because of their physical characteristics, are easily applied, and require less equipment and lower temperatures for application.

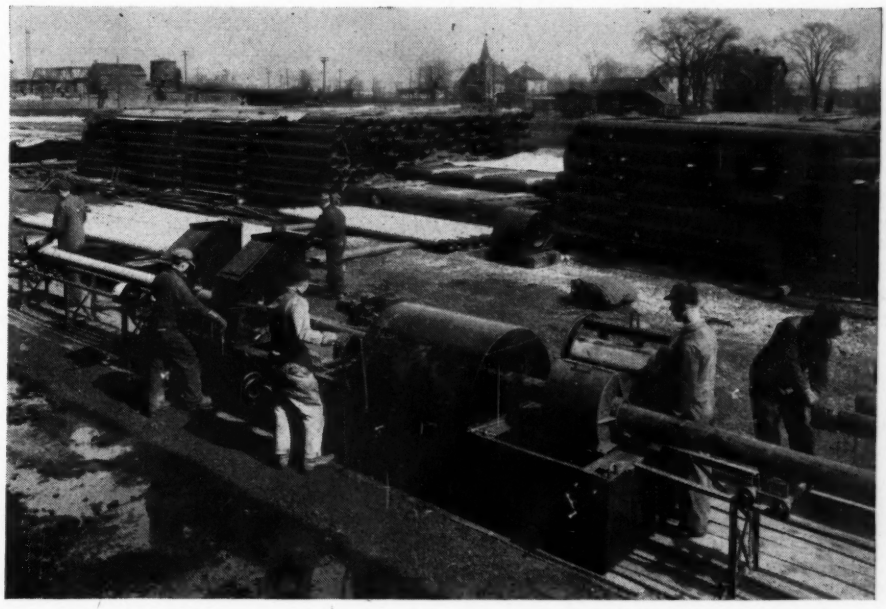


FIG. 1. Coating pipe with No-Ox-Id wax type coatings by means of stationary machine.

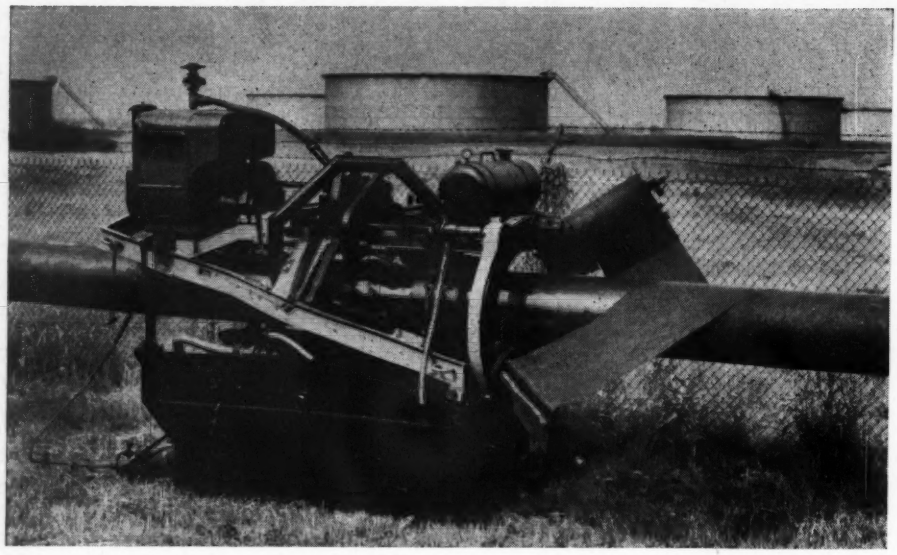


FIG. 2. Traveling type coating machine used to apply No-Ox-Id wax type coating in the field.

Proper application methods must be used, or coating failures will occur. Furthermore, if the properties of a coating are not what they should be, the results will be unsatisfactory for the following reasons:

In the first place, the hard enamel type of coatings, when applied hot, will generally set up instantly, the moment the materials hit the cold surface, with the result that in the event deep pits or irregular surfaces are on the pipe, the coating does not have an opportunity to fill in these depressions, and consequently voids are left where moisture may collect, and corrosion will take place. The writer has seen this demonstrated many times in the field, particularly on reconditioned jobs where the pipe is cleaned in the field, or cleaned by machine at a central cleaning yard.

It is the purpose of a coating to fill in these voids and to prevent any further action. With the wax or grease type coatings, when properly applied, and in the case of high viscosity materials, sufficient material can be forced into these depressions or pits to completely fill them, thus preventing moisture from collecting at these points. In the case of the lighter consistencies, or semi-plastic materials, sufficient time can be employed in their application to insure the surface being thoroughly "wet" with the material, and intimate contact is produced between the metal surface and the coating.

These characteristics are particularly desirable when this type of coating is to be applied to second-hand pipe. On reconditioned jobs, in a great many cases, it is impossible to take the line out of service, and the work must be done in the field, either in the bottom of a ditch or on top of the excavation. Under such conditions, hand cleaning is generally resorted to, and the type of coating used must be of such a nature that it can be applied easily and quickly, so that the pipeline can be lowered into the ditch and back filled. In many cases, reconditioning jobs are of short distances, and the expense involved in bringing heating equipment to the job to take care of a short section of line would be excessive, but in using a cold applied coating, less labor expense and equipment would be necessary to complete the work.

On installations where new pipe is involved, there are wax type materials which can be, and are being, applied hot with considerably less equipment and labor involved. Due to the fact that these materials do not have as high softening points as the ordinary pipeline enamels, and also due to their extremely high viscosity, they are ideal coatings. These materials can be applied by machine, and, where desirable, a wrapper or reinforcing material can be applied directly behind the coating in the same position, and the pipe lowered immediately into the ditch, thus eliminating the necessity of a "lowering-in" gang. This is particularly advantageous where the softer materials are used, and the atmospheric temperatures run high such as those which are encountered in certain sections of the United States.

Another feature is the fact that, due to the extremely low water absorption properties of these materials, and because they contain chemical rust inhibitors, it is not necessary to apply a heavy film thickness. This is particularly true in the event a reinforcing or wrapping material is used over the coating. With the new methods of application, such as just referred to, considerable footage can be made per working day with a minimum amount of labor, due to the fact that it is not necessary to carry the extreme high temperature on the material. It is possible by this method to coat as much as 3 to 4 miles of 12-in. pipe in a 10-hour working day.

Use Under All Conditions

The present types of grease and wax type coatings have been used for many years in all parts of the United States, under all kinds of soil conditions—from the swamps of the southern states to the desert area of the Pacific Coast. Several lines have been coated with the softer consistencies without the use of wrapping materials, and buried in loose sandy or loam soils, and have given many years of satisfactory protection. These same consistencies, also the harder wax type materials, have been used in the swamp country, where they have been exposed to water at all times for years, and are still giving perfect protection.

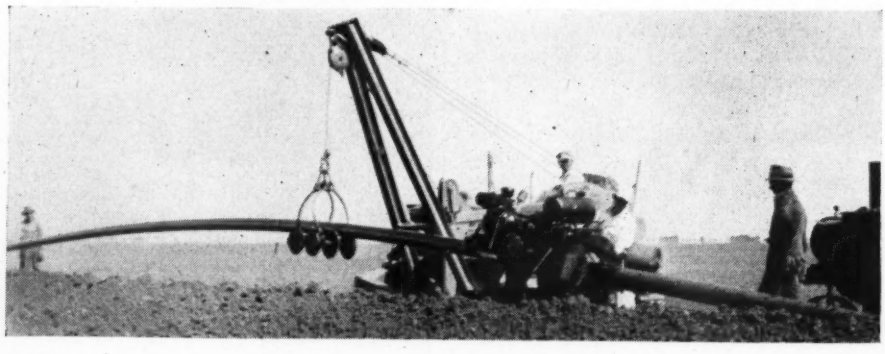


FIG. 3. Dolly used for suspending pipe while coating with traveling type coating machine. Pipe is lowered into ditch by machine immediately following application.

The present war has brought about conditions whereby certain raw materials, which were formerly used in manufacturing pipeline coatings and wrapping materials, are now being used exclusively for military purposes, and are not available for pipeline work. Due to these conditions, it was necessary to search the market for other raw materials which would be applicable for such purposes. New materials are now available which have all the chemical and physical characteristics of the materials formerly used, and, in some instances, their moisture absorption is even lower. Some of these basic raw materials have extremely high viscosity indices which have been found, from exhaustive laboratory and field tests, to have distinct advantages over the older types of material. When these basic raw materials have been formulated into coating compounds, particularly those that are applied cold to second-hand or reconditioned pipe, this increased viscosity permits application at higher atmospheric temperatures, and further permits the building up of a more substantial film thickness. The tendency to sag or flow at elevated temperatures is materially reduced, and can be used in locations where formerly this consistency of material was not practicable. Furthermore, these new basic raw materials, while shownig lower water absorption, have higher dielectric properties which make them particularly valuable as a saturant in the manufacture of pipeline wrappers.

Value of Wrapper

The value of a wrapper or reinforcing material cannot be overemphasized where it is used as added protection in highly corrosive soils. In the fabrication of these wrappers, it is possible, because of some of these physical characteristics, to get a more complete penetration and saturation into the fibers of the base material. By increasing this penetration and saturation, together with the high viscosity, a more substantial thickness of surface film can be produced, and in so doing, the dielectric strength is increased. This is a particularly desirable feature where cathodic protection is to be applied soon after a line is installed. Many engineers are advocating a thinner film thickness on the pipe, and supplementing it with cathodic protection. Others desire a heavier film thickness, and applying cathodic protection to a line after a period of four or five years, or possibly more.

If the raw materials used to formulate the pipe coating material and the wrapper are composed of saturated hydrocarbons, the deterioration caused by exposure to the soil will be small, resulting in a high coating resistance, and, as a result, a much greater length of line can be protected with one cathodic protection unit.

The development of these coatings with new basic raw materials has necessitated the need for new application equipment, and there is now being perfected such equipment that will apply these high viscosity, hot applied materials, as well as the cold applied softer consistencies. This equipment is not available for general distribution at this time, but it will be in the immediate future.

Performance Data on Enamel-Type Pipe Coatings

WALTER F. ROGERS, Houston Chemical Laboratory, Gulf Oil Corp. From his paper "Performance Data on Enamel Type Pipe Line Coatings."

DURING the latter part of 1941 a series of tests were made to determine the electrical resistance of the enamel type coatings in use by the company. The ages of the coatings varied from 14.2 months to 12 years. These tests were considered advisable to determine the effect of several variables in the method of application of the coatings, the differences among the different brands of coatings used, and the quantity of electrical current required to protect pipe so coated. Some of these coatings had been tested several times previously, and additional data on the effect of underground aging were desired.

Method of Test

The test data obtained were the current picked up by the coated pipe and the voltage drop across the coating. From these measurements of (E) and (I) the value of the corresponding resistance is calculated. Fig. 1 shows the diagram of a typical setup and the method of calculation.

The actual technique required a ground bed, a welding machine for D.C. current output, a copper sulfate electrode and a 0 to 4 volt potentiometer. The ground bed was constructed by placing 10 ft. of 6 in. pipe in a 2-ft. wide ditch, 18 in. deep. The ditch was a minimum of 20 ft. from the pipe line to be tested. The soil was back-filled along with 500 lbs. of salt and the remaining voids filled with water. The positive cable of the welding machine was connected to the ground bed and the negative side to the coated pipe. The arrangement of pipe and salt gave a ground resistance resulting in current outputs of 9 to 50 amp. The variation was due largely to the short time allowed for the soil to become salt soaked in the case of the 9 amp. output. The welding machine voltage in these cases was 40 volts. The amount of current required for this type of test varies with the number and distribution of pipes in the right-of-way but must be of sufficient strength to give a minimum 5.0 millivolts potential drop along 100 ft. of pipe at the drain point.

While the current was alternately flowed to the pipe and cut off at

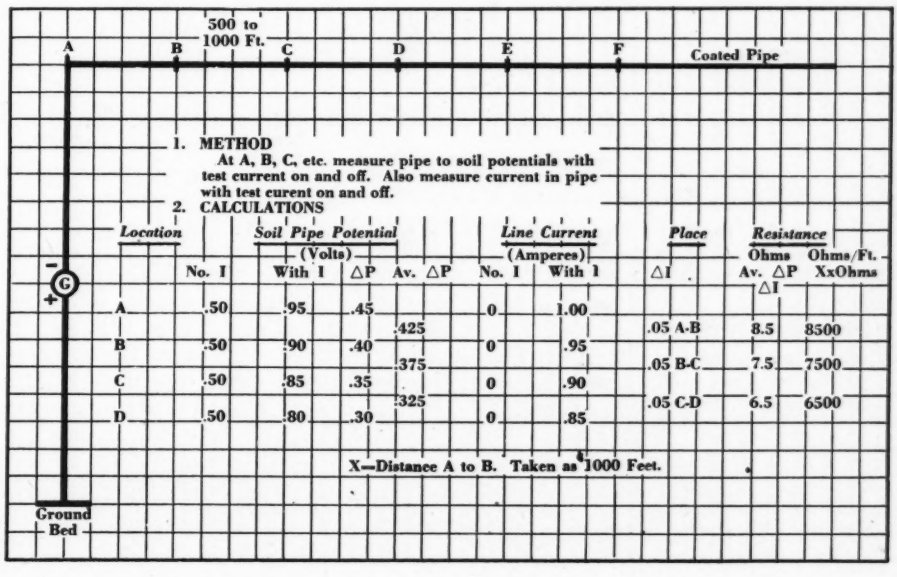


FIG. 1 Apparatus and procedure for measuring coating resistance.

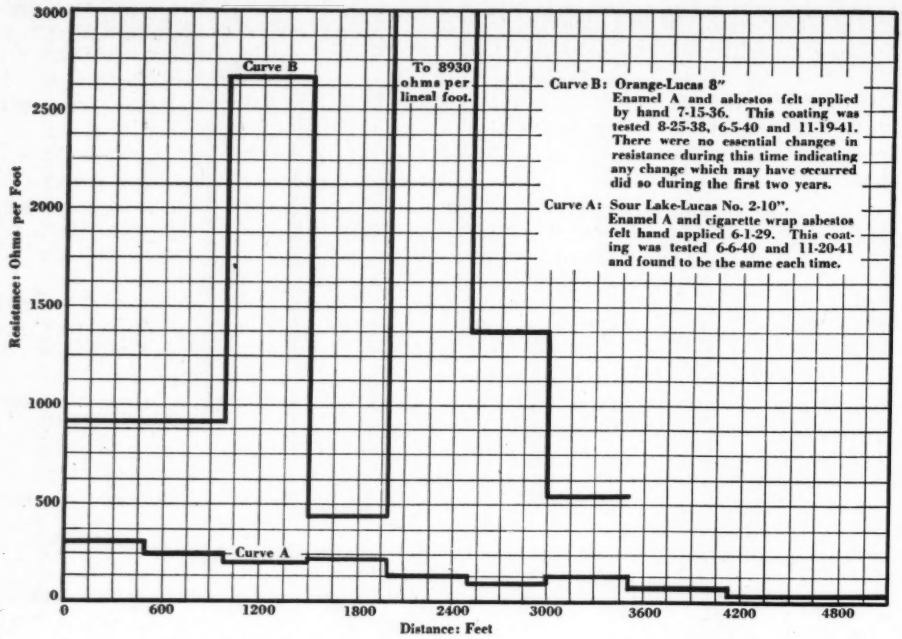

Curve B
To 8930 ohms per lineal foot.
Curve B: Orange-Lucas 8" Enamel A and asbestos felt applied by hand 7-15-36. This coating was tested 8-25-38, 6-5-40 and 11-19-41. There were no essential changes in resistance during this time indicating any change which may have occurred did so during the first two years.
Curve A: Sour Lake-Lucas No. 2-10". Enamel A and cigarette wrap asbestos felt hand applied 6-1-29. This coating was tested 6-6-40 and 11-20-41 and found to be the same each time.
Curve A
Resistance: Ohms per Foot
Distance: Feet
0
500
1000
1500
2000
2500
3000
600
1200
1800
2400
3600
4200
4800

FIG. 2. Effect of age on hand applied pipeline coatings.

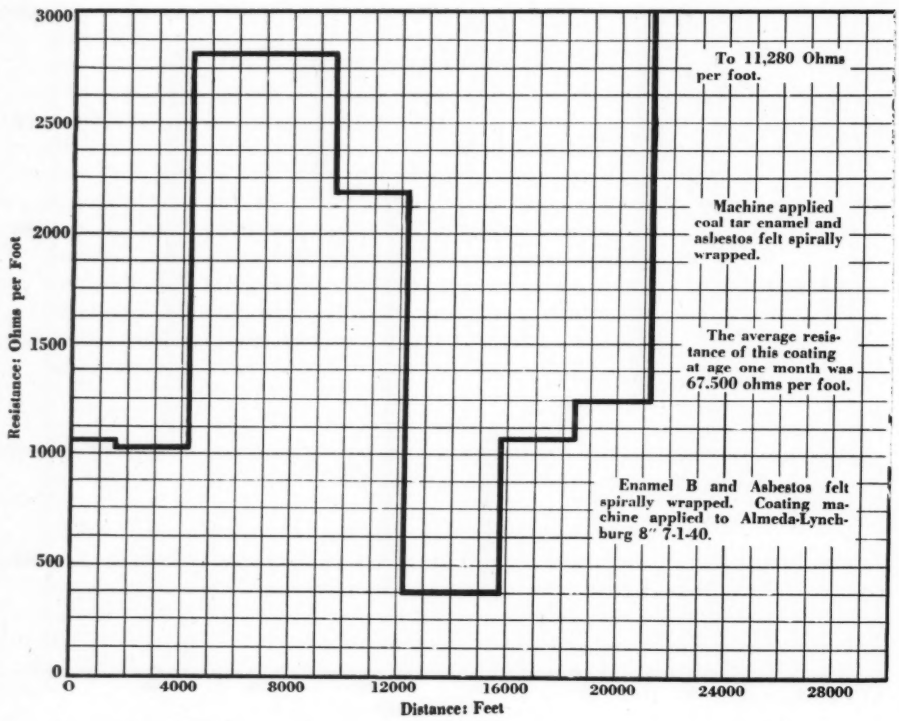


FIG. 3. Electrical resistance of a pipeline coating after 14.2 months.

5-minute intervals measurements were made along the coated line. The measurements were taken at intervals of 500 ft. to 1320 ft. The greater the coating resistance, the greater the distance required between readings to get a change in value greater than the precision of the readings. The measurements made at each location were the pipe-to-soil potential using a copper sulfate reference electrode and the voltage drop along 100 ft. of the pipe. The measurements were made at each place both with the current flowing and with it off. Contact was made to the pipe with heavy, sharp pointed steel bars. These measurements completed the field work, and the remaining calculations were made later. The time for a crew of four men to drive to the location, install the ground bed, take the readings, remove the ground bed and return to the station varied from six to eight hours.

The data were obtained on five different lines. The same data had been obtained previously on three of these lines at least one time and for one of them twice.

Comparison Data

For best comparison the data have been divided into three groups. These are illustrated in Figs. 2, 3, and 4.

Fig. 2 shows the condition of two sections of enamel A and asbestos felt applied by hand.

Curve A shows the condition of the enamel on the Sour Lake-Lucas No. 2-10 in line 11½ years after being applied. When this coating was installed the asbestos felt was applied by being wrapped lengthwise or cigarette fashion around the pipe. Later practice developed the spiral direction of application now used almost exclusively. Reference to the curve shows that the resistance of the coating was calculated in units of 500 ft. each. The resistance values are quite low and vary from 25 to 300 ohms per lineal foot. Pipe of 25 ohms per ft. resistance in this soil is practically bare. Resistance values greater than 25 ohms per ft. show the presence of greater quantities of coating. On June 6, 1940, or a year and five months earlier, the resistance of this same section of coating had been determined. The results at that time were identical with those of the later test. This shows the coating breakdown had occurred prior to the 1940 inspection.

Curve B shows the condition of the same brand of enamel, hand applied but with a spiral wrap of asbestos felt applied to the Orange-Lucas 8-in. line. This coating lies through a wet marshy soil where corrosion rates are very high but soil stress and clod indentation of the coating is low. This coating was applied in 1936 and was tested after 25 months, 47 months and 65 months. No essential changes in the coating resistance were found during these three test periods. This shows that any coating break-down which occurred did so during the first 25 months after the coating was applied. It will be noted that the coating resistance varies from 425 to 8930 ohms per lineal ft. This is both a considerable range in coating resistance and a considerable increase in resistance over the maximum for the other line with the same but older coating. The increased resistance is believed to be due to both better application of the coating and to the greater serviceability obtained from the spirally applied asbestos felt.

Fig. 3 shows the condition after 14.2 months underground of approximately five and one-half miles of

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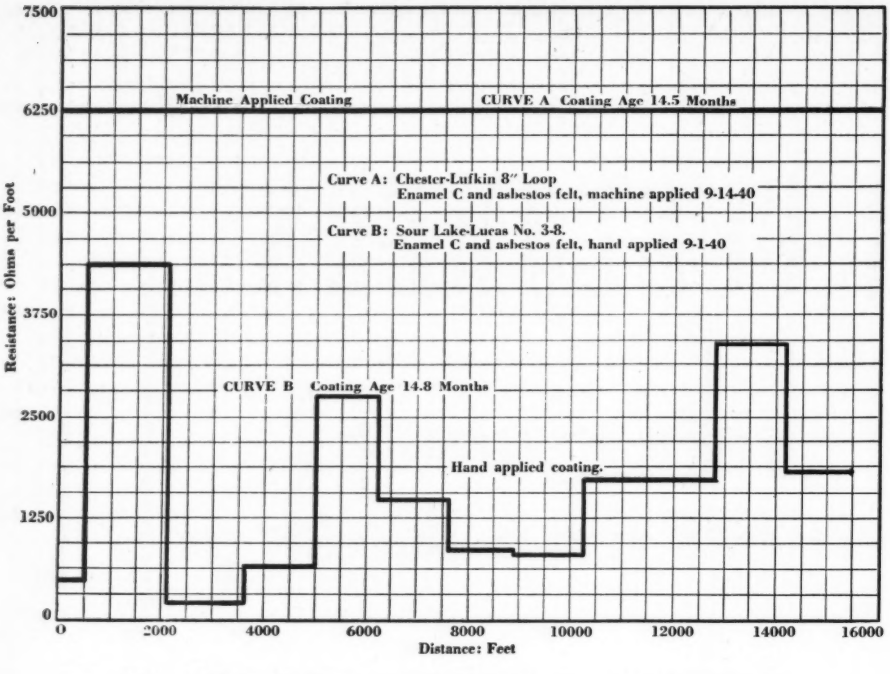


FIG. 4. Effect of age on hand and machine applied pipeline coatings.

enamel B and asbestos felt spirally wrapped. This coating was applied by machine during July of 1940. The following month the resistance of this coating was determined and found to be 67,500 ohms per ft. This is an extremely high resistance. After 14.2 months burial the resistance was redetermined over 6 miles of the coating. The resistance was found to have dropped to between 375 and 11,280 ohms per ft.

Fig. 4 shows the conditions of two sections of enamel C after 14.5 to 14.8 months burial. The amounts of coated pipe tested in each case were approximately three miles. Curve A shows the resistance obtained for the machine applied coated section. The resistance curve is quite level and has the average value of 6250 ohms per ft. This stretch of coating lies through well drained predominantly sandy soils of high resistance. This soil resistance is included in the 6250 ohms per ft. but even excluding the soil resistance only reduces the coating value to about 6000 ohms per ft.

Curve B shows the resistance of a three mile section of the same coating applied by hand. While this stretch of the coating is only 0.3 months older than the first the resistance values are much less. These vary from 4375 to 150 ohms per ft. with an average value of 1280 ohms per ft. Undoubtedly some of the difference in resistance between the two sections of coating is due to the difference in method of application, as it is to be expected that the machine applied job would be the better. The soils, however, along the hand applied stretch are more clayey and drainage is poorer than for the machine applied section, and this undoubtedly has contributed some to the lower resistance.

Calgary Rate Increase Anticipated

By R. W. CLARKE
Canadian Correspondent

A SPECIAL civic gas committee in Calgary, Alberta, anticipates that gas consumers in Calgary and at other points along the Calgary Gas Co. lines will be faced with an increase in the gas rate, according to a report made recently by the committee to city council.

"We think it can reasonably be said a share of the costs of gas conservation plans will have to be borne by the ultimate consumer together with others who will benefit by the schemes," said the report. The committee contended, however, that no increase in the rate actually is necessary.

At hearings of the Natural Gas Utilities Board in Calgary May 9 and May 25, 1944, the city took the position that plans for gathering and conservation of gas in Turner Valley, as submitted by British American Oil Co. and Gas & Oil Products, Ltd., were "not in the best interests of the consumer."

Since the hearings, the board has issued three orders: The first instructing B-A Oil to put into effect its plan for gathering of low pressure gas and re-pressuring machinery; the second directing the Madison Natural Gas Co. to construct works to connect with the B-A setup; the third authorizing the construction of works connecting the Gas & Oil Products layout with the others.

According to the gas committee report, the solicitor for B-A Oil declared at the Gas Utilities Board hearings that his company was prepared to carry out its plan and deliver gas without any increase of price to the consumer.

The report adds:

"If this company can do this, we see no reason why the others should not be able to deliver gas without any increase. Should it eventuate that the rates, of necessity, will be increased beyond reason to pay for these schemes without a guarantee of materially extending the lifetime of the field, then every effort must be made to secure natural gas from the Gas Company's fields other than Turner Valley."

The committee's experts were instructed by city council to prepare all necessary data in the interests of gas consumers for submission to the next hearing of the Gas Utilities Board.

Hugoton Conservation

The Kansas Corporation Commission, which is cooperating with the Oklahoma Corporation Commission in measures to conserve natural gas in the Hugoton field of Kansas and Oklahoma, allotted 6,685,228,108 cubic feet of gas in July to the field in Kansas.

An order issued by the Kansas Commission extends from April 1 to September 30, 1944. During July seven new gas wells were completed in the Hugoton field and 10 retests were made in the Hugoton, Otis and Cunningham fields.

The Kansas Commission has granted application of the Northern Natural Gas Company to have allowables assigned to 11 projected wells in Stevens County and one in Finney County, following their completion.

FPC Orders Louisiana Rate Reductions

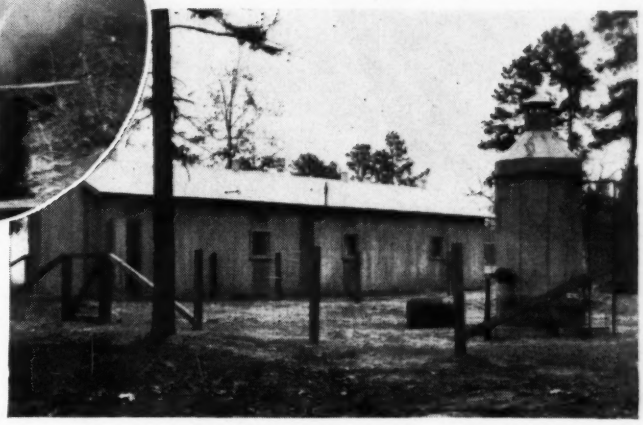
F. P. C. has announced its order allowing new rate schedules filed by the Interstate Natural Gas Co., Inc., and United Gas Pipe Line Co., to become effective on all bills rendered on or after June 15, 1943.

The order accepts (1) new rate schedules filed by Interstate reducing rates for natural gas transported for, and sol dto, United Gas Pipe Line for resale in the New Orleans area, and (2) new schedules filed by United Gas Pipe Line to pass on the reduction received from Interstate to New Orleans Public Service, Inc., and Louisiana Power and Light Co.

WARTIME PIPELINING

By ROBERT M. HUTCHISON
Chief Engineer,
Houston Natural Gas Corporation,
Houston, Texas

ABOVE: Just one of the times that the caterpillar tractor bogged down during pipe stringing. CIRCLE: Blowing dust and dirt from the line prior to the tie-in of sections.



RIGHT: Regulator station and heater constructed at Spurger field.

THE Houston Natural Gas Corp. last November began constructing 14½ miles of 4½-in. O. D. gas pipeline from the Silsbee Field in Hardin County to the Joe's Lake Field in Tyler County, Texas, for the purpose of augmenting the natural gas supply for the town of Silsbee, in which are located large railroad shops and a lumber mill.

In order to assure an early completion of the project, arrangements were made to lay the line along an established pipeline right of way. This greatly reduced the laying time because it eliminated the necessity of cutting a new right of way. Due, however, to the existence of a telephone line in the center of the right of way, the construction had to be carried on within a strip about 10 ft. wide for practically the entire length.

When work began, the weather was ideal, the right of way was practically dry and enough labor was available to indicate that normal progress would be made. Whether it was over-optimism or just plain run-of-the-times difficulties, no one can say, but it was not long until conditions had changed to such an extent that at times it seemed as though pipe lining was impossible. In a few days heavy rains made such a quagmire of the right of way that the ditching of the line had to be suspended. Pipe stringing had to be done with "cat wagons" and heavy tractors because trucks and trailers entering the right of way were soon buried in mud up to their axles.

Because of the heavily wooded country, very few roads extended to the pipeline location and, therefore, it became necessary to stack large amounts of pipe at various locations and make many trips up and down the right of way when stringing the pipe. These numerous round trips, accompanied by heavy rains, created a right of way condition which was almost impassible. Mule teams which were first used for distributing skids and hauling materials had to give way to tractor-drawn sleds when the animals were no longer able to wade through the mire and in many places poles had to be cut from the surrounding timber and used to form a cushion for the tractors. In spite of these measures the "cats" bogged down many times and had to be pulled out with winches.

These troubles soon proved that the round-trip method of pipe stringing could not be continued, especially in the last 4-mile section which, by the time it had been reached, had become

BELOW (Left): A 300-ft. stretch of planking laid over a soft creek bed. (Center) Starting to drag the 2500-ft. pipe section. (Right) Logging bridge built by cutting 50-ft. pipe trees to support planking, then constructed with cross planking to hold a 50,000-lb. in addition to a 20,000-lb. tractor.

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worse than expected. Consequently, the surrounding country was very carefully surveyed and, as a result, some old tramways that had been used for logging operations were found. These furnished some semblance of roads through the forest, and as they crossed the right of way at several places, were convereted into trails wide enough for the passage of the tractor-drawn "cat wagons" loaded with pipe. By using these trails, it was possible to enter the right of way at one place with a load of pipe, proceed along the route of the line and leave by another route without too much damage being done to the narrow roadway as was done when the round-trip method was employed.

In preparing the tramways for use as roads, many places were found where the ground was of such a spongy nature that bridges had to be built before the movement of heavy equipment could be undertaken. These swamp areas, in the lingo of East Texans, are called "baygalls," a word which became very distasteful to all who were connected with this job long before the work was completed. Regardless of the route or direction of travel, these baygalls were inescapable and each had to be considered individually before a crossing could be effected. Over some, the ordinary type of corduroy road was sufficient, but others were so deep and so soft that a real bridge was needed. At these places the trunks of three green pine trees sufficiently long to span a bad spot were placed as stringers or tracks for each caterpillar tread and, in order to prevent the logs from moving, they were anchored into the ground and crosstimbers 3 in. x 10 in. by 12 ft. were nailed crosswise the full length of the bridge. Bridges built in this manner will support loads in excess of 60,000 lbs.

The corduroy roads and bridges solved the stringing problem, but as the laying progressed through this 4-mile section, it became evident that the old familiar adage that "the last half-mile is the hardest" was true. An investigation showed that it would be impossible to lay pipe through the last 2500 ft. of the right of way and, as sky hooks were not available, it was decided to weld a string of pipe long enough to reach to the end and drag it through with a heavy tractor. The dragging operation was successful even to the extent that the coating was not damaged, but as had happened before, there were times when the tractor became stuck and had to extract itself by means of its winch.

When gas was turned into the line, a pressure test of 500 lb. disclosed that it was tight.

MEASUREMENT IRREGULARITIES FOUND IN CHART RECORDS

EXCERPTS FROM Appendix I of Southern California Gas Co.'s Measurement Manual prepared by J. T. CORTELYOU.

THE person who reads the chart from the orifice meter has an excellent opportunity to determine conditions prevailing at the meter, and to inform the office of irregularities.

The following discribes certain irregularities, gives causes, and a brief picture of how the condition can be remedied.

Nature of Irregularity	*Cause and Possible Cure for Irregularity*
1. Differential record goes below zero. Reverse flow impossible or improbable.	Gauge has lost mercury since last calibration. More mercury should be added.
2. Differential record has been constant at a given value for sometime. It suddenly goes over the top of the chart for an instant and then returns to record a steady value lower than before the sudden jump.	A sudden instantaneous overload caused the mercury to rise suddenly in the low pressure side of the manometer and a small portion spilled over the top. This action has lowered the reading at zero or any point on the chart. More mercury should be added.
3. Flow stops abruptly and the differential record falls abruptly, but does not go below the zero circle for an instant.	This indicates that the float may be resting on the bottom of the manometer chamber. It should be floating on mercury at zero, and inertia should send it below zero for an instant when it approaches zero rapidly. Add mercury.
4. Flow increases suddenly and the differential record rises suddenly and abruptly stops at a point below the top of the chart. This is the reverse of condition No. 3.	This indicates that the float may have hit an obstruction as inertia should carry the float beyond its new level for an instant when it approaches its new level rapidly. Remove the obstruction.
5. Flow stops abruptly and the differential record does not approach zero along a time arc.	The length of pen arm has been changed so that the pen point no longer follows the arc. Adjust pen arm.
6. The differential record is constantly too low to be read accurately.	The orifice size is too large. A smaller size orifice should be installed.
7. The differential record is frequently beyond the range of the chart.	The orifice size is too small. A larger size orifice should be installed.
8. The differential record crosses the pressure record with a scratching and splashing of ink.	The two pens do not give each other clearance. They should be adjusted to pass freely.
9. The chart records are too faint to read.	The pens are dirty, and the ink does not flow. The pens should be cleaned.
10. There is no chart record.	The pen lifter which lifts the pen off the chart while it is being put in place. keeps the pens off the chart while it is in service. Adjust pen lifter.
11. The chart record is only up and down the time arc.	Either the hub that holds the chart on to the clock shaft is loose or the clock has stopped. Either the hub should be tightened or the clock replaced.
12. Daily chart record is continually more or less than 24 hours in duration.	The clock is either fast or slow and should be adjusted.
13. The differential record begins to surge or rapidly move between two valves, where it has never done this before on the meter in question.	This may mean that liquid has accumulated in the gauge lines and they should be blown clean. Only a field inspection can ascertain the real cause of this. Office should be notified.
14. When the flow stops, the differential record goes to zero but the pressure record starts to climb.	This indicates that a regulator in the supply line leaks and cannot hold the proper pressure downsteam when there is no flow. The regulator should be repaired or replaced.
15. The pressure record changes but the differential record does not change.	The differential pen is probably binding and not able to record small changes.

ASSOCIATIONS

Canadian Meeting

The presentation of research and operating papers featured the 19th annual meeting of the Natural Gas & Petroleum Association of Canada, attended by 200 members, at Niagara Falls, Ontario, recently.

Dr. Charles Evans, geologist, Union Gas Co. of Canada, Ltd., Chatham, Ontario, presented a paper entitled "Natural Gas Fields of Southwestern Ontario." This survey presented in graphic form the existing gas horizons, their geographic distribution, the types of gas structures found, methods of finding these structures and a description of relatively untested areas which might be searched for new sources.

Dr. Evans was introduced by S. B. Severson, Dominion Natural Gas Co., Ltd., Buffalo, N. Y., first vice-president of the association, in the absence of the president, Major E. Sweet, Dominion Natural Gas Co., Ltd., Brantford, Ontario.

Experience in the operation of low pressure, low production wells were outlined by Lorne Price, Engineer, Dominion Natural Gas Co., Ltd., Dunville, Ontario.

R. M. Conner, director, AGA testing laboratories, presented a paper entitled "Research Will Light the Way" and described the development of the 100% Primary Air Burner developed by the Testing Laboratory. He also described the broad and extensive domestic gas research program which produced nine research bulletins in the past year. Eugene D. Milener, secretary, Industrial and Commercial Section, AGA, commented upon the activities of his section.

"Distribution Problems in Connection with Utilization of Mixed Gases," were described by D. H. Thorburn, Industrial Engineer, United Gas & Fuel Co. of Hamilton, Ltd., Hamilton, Ontario, substituting for K. J. Burnett, General Superintendent of the same company.

The following officers and directors were re-elected:

Officers: C. E. Steele, Port Colborne, Ontario, honorary president; Major E. Sweet, Brantford, Ontario, president; S. B. Severson, Buffalo, N. Y., first vice-president; J. A. Richie, Buffalo, N. Y., second vice-president; S. A. Morse, Union Gas Co. of Canada, Chatham, Ontario, secretary-treasurer; Jos. McKee, United Gas & Fuel Co. of Hamilton, Ltd., Hamilton, Ontario.

CALENDAR

September

Mid-West Gas Association, 2nd of four one-day sectional meetings—Hotel Fontenelle, Omaha, Neb., September 12.

Pacific Coast Gas Association, Annual Meeting—Ambassador Hotel, Los Angeles, September 13-14.

Gas Division of Oklahoma Utilities Association—Oklahoma City, September 22.

Indoor Climate Institute Forum—Book-Cadillac, Detroit, September 21-22.

October

National Safety Congress—Sherman, Morrison and La Salle Hotels, Chicago, Ill., October 3-5.

American Gas Association, Annual Meeting—Engineering Society Bldg., New York City, October 5.

November

Mid-West Gas Association, 3rd of four one-day sectional meetings—Minneapolis, Minn.

ICI To Hold Open House In Detroit, Sept. 21 and 22

The Indoor Climate Institute will hold its first Open Forum meeting in Detroit September 21 and 22, according to an announcement by President P. B. Zimmerman. The annual meeting and election of officers will be held simultaneously with the Open Forum.

Controlled indoor climate is the 4th dimension in living, ranking in importance with food, shelter, and clothing, stated Zimmerman, and the Open Forum will afford related industries an opportunity to look at the facts and subjects having a direct bearing on the present and postwar markets for their products. Above all, he said, it will give these industries a voice in moulding public opinion to a point where the living standards of Americans will be increased through obtaining greater indoor comfort and health.

ICI's purpose is to assist manufacturers and trade associations in the promotion of controlled indoor climate and to serve as a clearing house of unprejudiced information. Seminars during the Open Forum will be devoted to the following subjects:

Editor's Panel (Public Information Committee); Local Chapter Activities (Local Chapters Committee); Training for Postwar Jobs (Postwar Personnel & Training Committee); Trade Associations' Interest and Participation in the ICI Program (Trade Associations' Committee); Speakers' Bureau Activities (Speakers' Bureau Committee); Science Groups' Interest and Participation in the ICI Program (Science Committee); General Promotion of the ICI Program (Promotion Committee).

Convention Cancelled

The Executive Board of the American Gas Association, acting in response to an urgent request of the Office of Defense Transportation, has voted to cancel the 1944 Annual Convention. Facilities at the Stevens Hotel in Chicago have been released.

In compliance with the Constitution of the Association and with the membership corporation laws of New York, an Annual Meeting will be held without speaking program and for the transaction of routine business at the Engineering Society Bldg., New York City on October 5.

It is anticipated that the meeting will be completed within two hours, during which the meeting will receive the reports of the President and Treasurer, elected officers and transact other routine business. The report of the President will doubtless consist in the main of presentation of the report of the Committee on Gas Industry Promotional Development with discussion by the executives who will be invited to attend.

Gas Plant Topic of Sept. SCMA Meeting

The next regular monthly meeting of the Southern California Meter Association, scheduled for the Rio Hondo Country Club, Downey, on Sept. 21, will feature a paper on "Measurement and Control in Medium High Pressure Natural Gas Plant and Field Gathering System," by Charles G. Hardy, General Petroleum Corp. There will also be a talk on the people, living conditions and present government of Japan by Dr. F. W. Heckelman, who spent 36 years as head of the Methodist School in Tokio.

The Association's August meeting, held at the Rio Hondo Club, was highlighted by a story on the development of synthetic rubber production since Pearl Harbor by H. R. Erwin, assistant technical superintendent of Goodyear Synthetic Rubber Corp., who also showed a sound motion picture.

Mid-West Group Schedules Second Meeting

The Mid-West Gas Association will hold the second in its series of four One-Day sectional meetings at the Hotel Fontenelle, Omaha, Neb., on Tuesday, Sept. 12. J. E. Walsh, M. K. Wrench and Larry Shomaker comprise the committee in charge of arrangements.

Two luncheons—one for operating men, and another for sales and accounting men—will be held at noon, followed by separate discussion panels in the afternoon, the meeting to be adjourned at 4:30 p. m.

Industrial Gas Curtailed In Moncton, New Brunswick

Some gas consumers in the city of Moncton, New Brunswick, and the surrounding district will benefit while others will be deprived of gas, as a result of two orders issued recently by the New Brunswick Board of Commissioners of Public Utilities.

Under the first order, the Moncton Gas & Electricity Co., is required to cease furnishing gas to two classes of users on and after Sept. 1. The order bans the use of natural gas under boilers and in furnaces or other heaters which are readily convertible to the use of another fuel

In addition, the order prohibits use of natural gas in industrial and manufacturing plants. Previously, under an order issued Oct. 29, 1943, the company had been permitted to supply natural gas to these plants during those hours of the day and night when the load for domestic purposes was light.

The second order results from recommendations made by C. H. Lutz, gas expert. It allows the installation of gas-burning equipment for cooking purposes and the heating of hot water in residences, the owners of which had permits of construction from the Controller of Construction, Ottawa, at the date of Oct. 29, 1943. The Moncton Gas & Electricity Co. is made responsible that installations be made only to property owners who qualify under the order.

Study Reveals Pennsylvania Natural Gas Waste

In a survey made by Tom Bailey, petroleum engineer, for the state Conservation Department, swift decline in bottom-hole pressure and waste of natural gas were revealed in the Pennsylvania sand zone of the Pauls Valley field, Garvin County, Okla. With 46 wells used in the study, a gas-oil ratio of 2443 was disclosed, the ratios ranging from 424 to 9753 ft. Production of the 46 wells was 7369 bbl. of oil and 18,000,000 ft. of gas per day. Some of the wells have pipeline connections for sale of natural gas, but most of the gas is popped into the air.

Reservoir pressure in the Pennsylvanian zone is dropping at the rate of 2.51 lb. per day, a survey of 16 wells shows. Periodic surveys have been made in the field, the last being completed July 17 and the previous survey being on April 17, an interval of 91 days. During this period the decline was 228.84 lb.

INGA Appoints Committee To Advise IOCC

The Independent Natural Gas Association of America has appointed a committee to represent it before the Interstate Oil Compact Commission in an advisory capacity.

This committee is composed of E. Buddrus, of Chicago, president of the Association; W. H. Wildes, of Dallas and Mark H. Adams, of Wichita, Kan. The action was in response to a resolution of the Compact Commission, inviting such associations to participate in its proceedings.

NEW GAS PRODUCTION

• Natural gas measuring 1,250,000 cu. ft. daily has been discovered at Bata No. 2 well, just south of the town of Unity, Saskatchewan, according to an announcement from Thomas I. Jackson, president of Bata Petroleums Ltd. The official pressure of the gas is stated at 675 psi.

Oil was encountered in the lime with heavy saturation, and Mr. Jackson says the well now is in a position to provide both oil and gas. Oil has also been discovered in the adjacent Vera field, the Vera No. 3 well being a substantial oil producer which will be finished, in addition, as a gas well.

The producing wells are about 20 miles apart, with comparison of the strata indicating a very large productive area. It is considered one of the most important discoveries of Saskatchewan oil and gas development, particularly as the Vera-Unity fields offer production from shallow depths.

• Mt. Vernon Car Manufacturing Co., a division of H. K. Porter Co., Inc., of Pittsburgh, has completed its first well at Zanesville, Ohio, resulting in production of 1 million cu. ft. of gas per day.

The well, Carpenter No. 1, in Morgan County, Ohio, is an important outpost well in the large holdings of the company in this county.

Mt. Vernon, largest independent freight car manufacturers in the nation, is also drilling on its Mississippi timber land in Smith and Covington counties, Miss., which lies drectly between the newly discovered Heidelberg pool and the recently completed 63 million cu. ft. Sid Richardson gas well.

• Standard of California's Rio Vista discovery well, Perry Anderson H-6, recently completed at 5855 ft., struck a new producing zone below the known reserves in the Rio Vista gas field. Standard plans immediate development of the new zone, named the "Anderson sand," to provide additional dry gas for anticipated increased demands in the San Francisco Bay region this fall and winter.

• Just north of the Montana border in the Canadian province of Alberta, a good gas producer has been brought in by McColl-Frontenac Oil Co. Company officials disclosed recently that drilling had been suspended at a depth of 4420 ft. While the lower part of the hole is being plugged off, it is expected the well will be capped pending the obtaining of a market for the heavy flow, estimated at between 13 and 14 mcf. Drillers encountered two high pressure gas sands, which showed small amounts of clear distillate, as well as a third gas zone which showed a substantial flow of sweet gas. No water was encountered.

• The Canadian Department of Mines and Resources intends to carry to completion this summer a comprehensive structural survey of the potential natural gas and oil resources of the southwestern section of the Province of Ontario.

J. F. Caley, a department geologist who has been carrying on investigations for the past two years, will be in charge of this survey, which is part of a Dominion-wide program launched by the Federal government this year in the hope of locating gas and oil reserves.

In addition to exploring and mapping the sub-surface structures, Mr. Caley also will collect and correlate data on recent drilling operations in the area. A feature of the new exploration will be a seismographic survey of the bed rock flooring lying approximately 100 ft. below the glacial drift in the district. Unlike many oil and gas areas in other parts of the world, the study of the geology of southwestern Ontario is handicapped by the fact that there are practically no rock outcrops. Although the seismograph has been used occasionally by individual operators in the district, this is the first time it will have been used on an extensive scale.

In the southwestern Ontario peninsula proper numerous formations regarded as possible sources of oil and gas are known to exist, as a result of drilling operations carried out since 1857. Oil was struck originally in the shallow Delaware and Onondaga limestone, between 200 and 550 ft. Later drilling encountered gas in the Niagara peninsula in the Clinton and Medina formations, and gas and oil in the Salina and Guelph Niagara formations in the Tilbury field.

The deepest source of oil and gas is the Trenton formation, which was tapped first successfully in Dover West about 27 years ago. Operators generally regard the shallow formations as pretty well drilled out, but small new fields have been opened in the shallow lime and the Guelph-Niagara in comparatively recent years. Toward the east, these shallower formations "pinch out" as the sedimentary rocks grow shallower.

The Trenton formation, which underlies virtually all western Ontario, is regarded by many operators as the best bet for future oil and gas fields. Though a considerable number of Trenton wells have proven dry holes, the amount of drilling has been small in proportion to the area where production may be found.

• **Sohio Petroleum Co.**, apparently opened a new gas field when it brought in late in June a gas well south of the old Dixie gas area in Eastern Stephens County, Okla.

The well was drilled to 2150 ft. and perforated at 1628 ft. It showed 5,000,000 cu. ft. per day on first tests.

The Texas Co. brought in a well west of Marlow, also in Stephens County, Okla., which gauged 9,250,000 cu. ft. per day of dry gas. The well was drilled to 6396 ft. and casing was perforated at 5325 ft.

• **Standard of California** recorded 40 well completions, including deepening and redrilling jobs, during the month of July, a substantial increase over the 25 wells completed in the corresponding period last year.

The nutrition center of the Milwaukee Gas Light Co. occupies a spacious corner on the company's main display floor. The company does its bit in other ways too, with booths devoted to the recruiting of nurses aids, to the Red Cross. to war bond sales.

Milwaukee's Sales Floor Does War Duty

THE greater part of the main sales floor of Milwaukee Gas Light Co., has been given over for use as recruiting offices of Red Cross Army and Navy Nurses, Nurses' Aides, and as headquarters of the War Finance Committee's "Minute Maids," who sell war bonds and stamps whenever there occurs a large gathering of people.

Since September 1, 1943, when the Nurses' Aide station was opened, 514 were enrolled in classes and 364 graduated. This has been a great help to 10 local hospitals and two blood plasma centers. It has further helped make it possible to release many regular nurses to the armed services. The Nurses' Aides in aggregate have served voluntarily for a total of over 257,000 hours since July 1, 1941. Since July 1, 1943, the Red Cross Army and Navy Nurse recruiting office here has enrolled 190 nurses who have since been commissioned as officers in the Nurse Corps. It has furnished its quota month after month and it is expected that this good record will continue.

The "Minute Maids" of the War Finance Committee has made and sold corsages and boutonnieres totaling $55,000 in war stamps. This magnificent job was accomplished by a corps of 30 young women headed by T. F. Kerwin, Gas Company divisional sales manager.

A Nutrition Center under the supervision of the Office of Civilian Defense completes the war service picture.

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Short-Time Tests of Solders And Soldered Joints

A series of short-time tests of 13 solders, mostly in the low-tin category, has been completed by J. A. Kies and W. F. Roeser of the National Bureau of Standard's Metallurgy Division. It was evident that modification of the tin-lead compositions by additions of small amounts of bismuth, antimony, silver, and copper made little difference in the shear strength of soldered joints at room temperature, although spreading was improved in some cases. The scarf joint was found to possess definite advantages for test purposes.

The effects of five variables on the short-time strength of soldered joints were investigated for the purpose of obtaining essential data which are considered useful in establishing standard procedures for making these short-time tests.

Los Angeles Utility Issues Canning and Drying Booklet

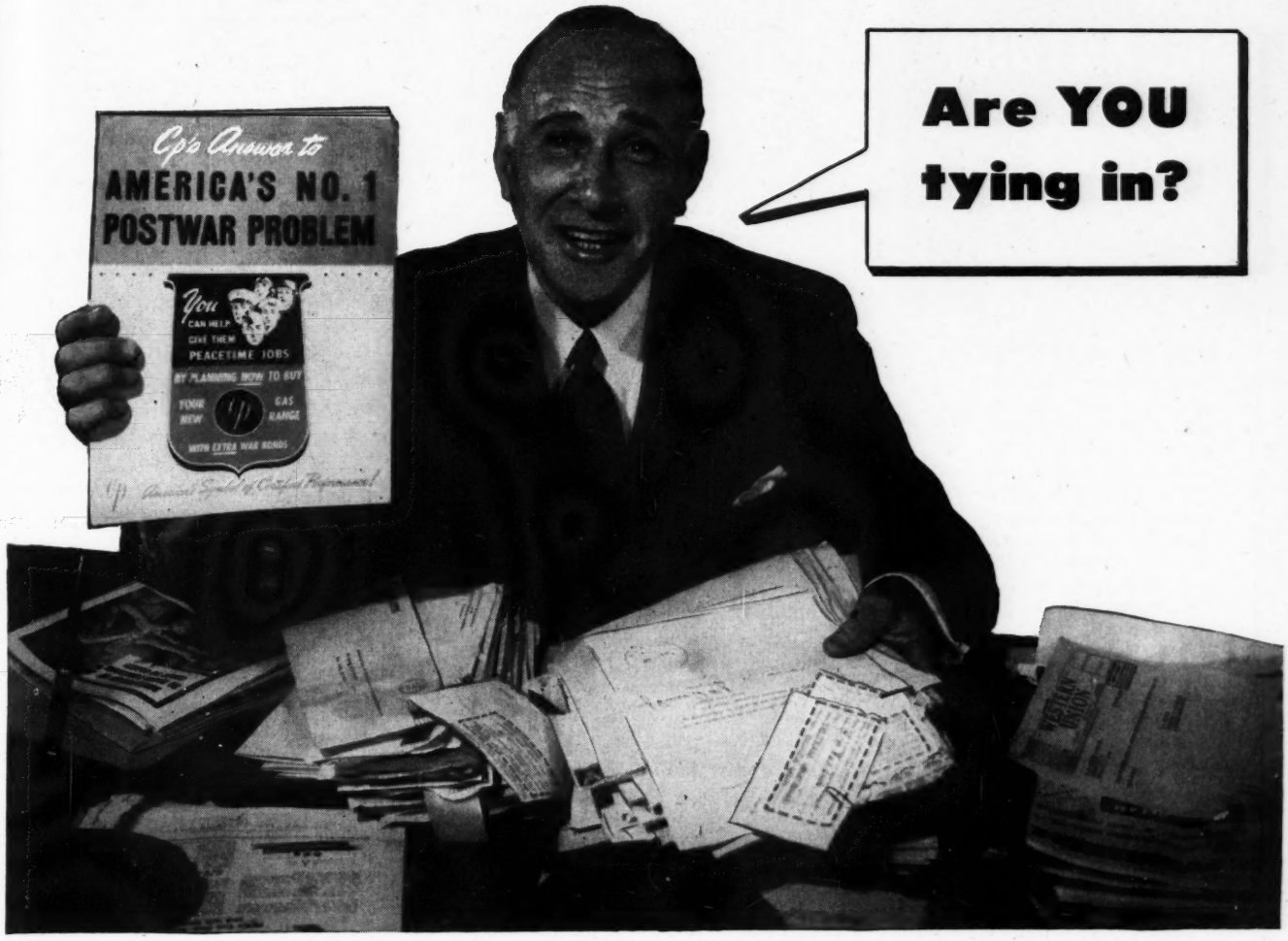
The Southern California Gas Co. has just published its latest edition of "Home Canning and Drying" as a free offering to its customers. The 34-page booklet contains the latest advice on food preservation, including canning by pressure-cooking and the boiling-bath method, and dehydration of fruits and vegetables by oven drying.

Each method is discussed with concise directions for equipment, sealing and storage, and there are charts showing the preparation and processing of fruits, vegetables and meats, while a special section treats botulism and its dangers.

Oklahoma Storage Project

Oklahoma Natural Gas Co., Tulsa, has begun the underground storage of billions of feet of natural gas near Haskell, Okla. The field covers five sections, and the company has leased an additional 2200 acres of land which, when completed, will comprise the largest gas storage system in Oklahoma.

SUCCESS STORY!



Results are what count! Requests for the "CP" Business Building Plan Kit are pouring in from appliance dealers, furniture stores, hardware stores, and department stores from coast-to-coast. Utilities using this Kit as a dealer contact are reporting outstanding results. That's PROOF your dealers want to cash in on the "CP" Business Building Plan now and after the war.

You, too, can build stronger dealer cooperation by getting a copy of this helpful "CP" Kit into the hands of every Gas Range dealer in your territory. If you can't deliver it personally, mail it!

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Visit the American Gas Association Testing Laboratory in Los Angeles, and see how a great industry regulates itself. ★ So urges a recent P.C.G.A. advertisement in *Building Standards Monthly,* official organ of Pacific Coast building inspectors. ★ The inspectors are also reminded that: "The A.G.A. Seal of Approval is your assurance of safety and performance standards exceeding building code requirements." ★ Thus, and in other ways, the gas industry of the West staunchly supports the national testing-and-approval program, and reminds regional inspectors of its significance in relation to the Uniform Building Code.

THE PACIFIC COAST GAS ASSOCIATION

UNIFORM BUILDING CODE

GAS FUEL

SERVING THE WEST IN WAR AND PEACE

Wire Bushing Wheels as Gas Line Plugs

FROM A Report to the Osborn Manufacturing Co., Cleveland, Ohio, producers of power brushes.

A DEPARTURE from the conventional uses of wire brushing wheels involves their application as heat dampeners for gas line shut-off plugs in case of fire.

The novel use for power brushing wheels was conceived and put into practice by the Southern California Gas Co., Los Angeles, Calif., one of the many firms in the industry which utilizes power brushing for such jobs as de-scaling, weld cleaning, rust removing and scores of other duties around oil and gas lines and refineries.

In describing the construction of the shut-off plug, the Osborn report pointed out the necessity of having these units available for cast iron gas lines in case of fire. A break in the line during a fire would endanger the entire system unless these emergency shut-off plugs were quickly inserted in the line. Unlike steel pipelines, which can be shut off by hydraulic jacks in emergencies, cast iron pipe will not withstand the excessive pressure without fracturing and releasing gas which may become ignited.

Disc-center section wire brushing wheels of the type shown in Fig. 1, are incorporated in the shut-off plug design, the brush size depending upon the diameter of the pipe in which the device is used. The plug consists of a rubber stopper, flanged by fibre plates with a disc-center section wire brushing wheel on each side (Fig. 2.)

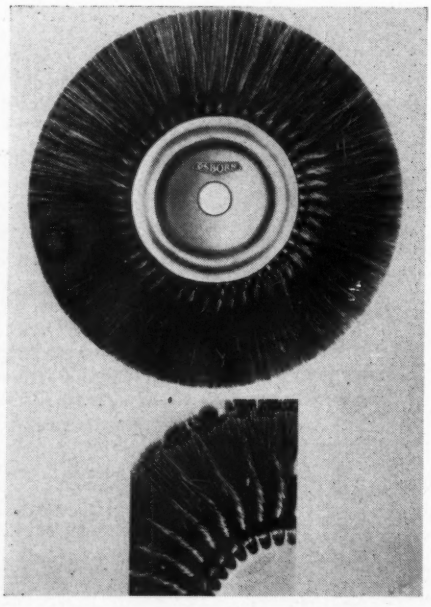


FIG. 1: This type of disc-center section wire brush, ordinarily used in industrial production and maintenance work, serves as a heat absorber for a gas line shut-off policy.

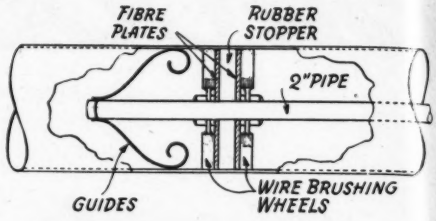


FIG. 2: Cut away view showing general design and use of shut-off plug for fire emergency use in gas lines of cast iron construction.

The plug is screwed on a 20-ft. length of 2-in. pipe which serves as a handle for inserting the plug into a broken pipeline without endangering the service operator.

According to the report, two plugs, each of 4, 6, 8, 10 and 12-in. sizes, are kept on hand in each of the gas company's service trucks which report to specified areas in event of breaks in the gas line.

The wire brushes are said to be very effective in absorbing the heat from the flames, thus adding greatly to the efficiency of the rubber stopper.

WPB Permits Experimental Model Production

Priorities Regulation No. 23, recently issued by WPB, permits manufacturers to produce postwar experimental models now, provided they in no way divert manpower or facilities from war work.

The release grants authorization to any person to engage in production of models heretofore prevented, on condition that such activity does not exceed $5000 a month in a single plant, including all direct costs such as materials, components, sub-assemblies, labor designing and drafting.

However, authorization to make experimental models costing more than $5000 a month in any one plant may be obtained from the WPB by sending four copies of application Form WPB-3879 to the field office nearest the plant in which the work is to be done.

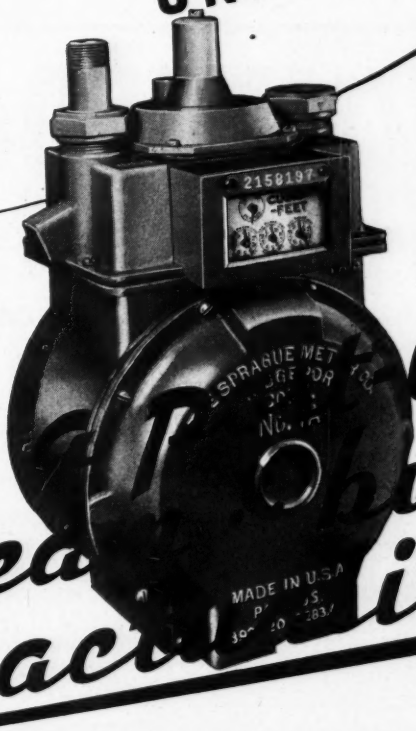
The new regulation is the second step in a series of four actions recently approved to provide a basis for eventual reconversion. It permits the manufacture of experimental models so that industry may develop new products which are superior to, or cheaper than, present ones.

Texas Company Dissolved

The Peoples' Light & Gas Co., which serves Austin, Galveston and Port Arthur, Tex., will be dissolved as a holding company, with the common stock of the operating companies to be distributed among holders of preferred stock on a basis of 3 shares of common and $13 in cash for each share of preferred held. The company will henceforth be known as Texas Public Service Co.

meters and regulators

INDIVIDUAL OR COMBINATION UNITS



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PEOPLE

Geo. F. Russell

• **Dr. R. L. Huntington,** Chairman of the School of Chemical Engineering at the University of Oklahoma, announces the recent appointment of **George F. Russell** as assistant professor on the Chemical Engineering staff. Before coming to the University, Mr. Russell had been connected with the Phillips Petroleum Co. in their natural gasoline division for a period of five years. Mr. Russell has done considerable research on problems pertaining to fractionation of petroleum and the dehydration of natural gas. At present he is continuing research in these two engineering fields.

• **George B. Tyler** has been named new business manager of the Arkansas Division, Arkansas-Louisiana Natural Gas Co., to succeed C. B. Wilson, resigned, according to an announcement by **D. W. Harris,** vice president and general manager.

Tyler, who was formerly associated with the Retail Credit Co., Dallas, and the National Life and Accident Insurance Co., Pine Bluff, joined ALGC in 1936 in the new business department of the Pine Bluff office. He remained in that office until his recent transfer and promotion.

• Iowa-Illinois Gas & Electric Co. has instituted a home service department headed by **Norma Pepler,** graduate home economist, to serve residents of Iowa City and Johnson county. Miss Pepler, who has been a faculty member of Iowa City High School, will advise on canning, nutrition, rationing, lighting and other problems, according to **George M. Sheets,** sales supervisor of the company.

• **Joe Kohlberg** has been appointed assistant to chief chemist, at Laclede Gas Light Co., St. Louis, Mo., to succeed the late **Ivan M. Roberts.**

• Florida-Gorgia Gas Meters Association elected to the presidency **W. Bond Collins,** Peoples Water and Gas Co., Miami Beach Fla. **B. G. Duncan,** Florida Power Corp., Orlando, was named secretary.

• **L. R. Morse,** manager of Pennsylvania Gas Co., Erie, Pa., has announced the appointment of **Fred W. Schildmacher** as assistant local manager to succeed the late F. W. Travers, Mr. Schildmacher has been with the company for 24 years, both in the distribution department, and in the office.

• **Ernest L. Olrich,** assistant to the Secretary of the Treasury, in charge of procurement and surplus, has announced the appointment of the following men as deputy directors to assist him in his work:

Russell C. Duncan, in charge of merchandising sales, served as president of the National Supply and Machinery Distributors Association, and is president of R. C. Duncan Co., Minneapolis, Minn. **Frederick R. Atcheson,** in charge of operations, is comptroller of Marshall Field & Co. Chicago retail stores, and a past chairman of the Comptrollers' Association of Chicago. **Albert W. Frey,** in charge of general trade relations, industry advisory committee, publicity, research and personnel was professor of marketing at the Amos Tuck school of business administration, Dartmouth College from 1921-1944, and is now on leave of absence.

• **Hugh Stewart,** former assistant superintendent of electric production, recently assumed the duties of executive engineer—a newly created post—at San Diego Gas & Electric Co.

Mr. Stewart, a graduate of Stanford University, joined the company in 1922 as an engineer in the construction department where he worked until 1938, when he was transferred to the electric production department. In 1940 he was made assistant superintendent of that department.

• The Foxboro Co., manufacturers of industrial instruments for measurement and control, announces the addition of **Paul Torre** to the staff of sales engineers covering the New England territory.

His headquarters will be at the Company's New England District Office, Foxboro, Mass.

• **L. B. Denning, Jr.,** operating manager of Lone Star's General Division of Distribution, has annouced that **Lester N. Minton,** formerly located at Stamford, has been appoined subdistrict manager at Rotan, succeeding **Robert N. Watson** who has been transferred to Stamford.

Carl Walsh has been appointed subdistrict manager for Lone Star at Iowa Park.

• **Mrs. Edna Miller Copeland,** former home economics teacher in West Virginia, has been named home economics director of Monongahela West Penn Public Service Co., Fairmont, W. Va. She had recently conducted special surveys in the field, and is well known in company circles.

• **E. L. Davis,** of Long Beach, Calif., has been appointed director of the Production Division in District 5 (Pacific Coast) of the Petroleum Administration for War. He was promoted from within PAW and succeeds **Lawrence Vander Leck.**

• **John S. Spaulding,** former advertising manager of Southern California Gas Co., has been promoted from Captain to Major in the Army Air Forces. A veteran flyer of the last war, he entered the service in September, 1942.

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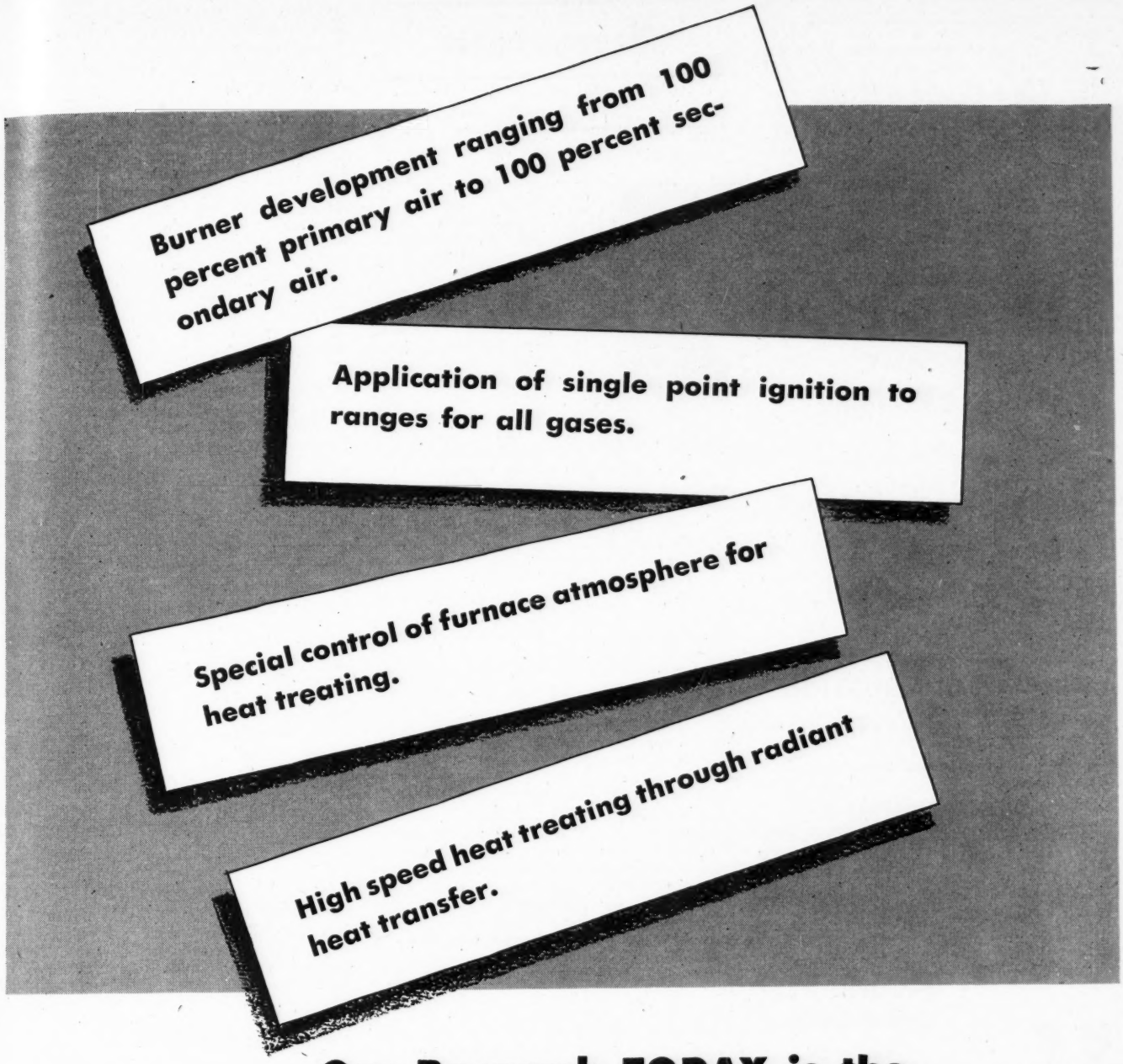
Burner development ranging from 100 percent primary air to 100 percent secondary air.
Application of single point ignition to ranges for all gases.
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Gas Research TODAY is the Gas Industry of TOMORROW

The livest subject in the Gas Industry Today—is the Research being conducted in the Industry's *laboratories*.

On this page are listed a *few* of the many outstanding Research projects conducted under the sponsorship of independent gas utilities, appliance manufacturers and the American Gas Association. They merit the fullest interest and cooperation of the Industry.

GAS

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Manufacturers

• Jones & Laughlin have announced the election of **Adam J. Hazlett,** general manager of sales, to the position of vice president in charge of sales. Mr. Hazlett had previously served in the sales department of West Penn Steel Co., and as sales manager and president of Eastern Rolling Mill Co. before joining Jones & Laughlin in 1938 as manager of the strip-sheet sales department.

Adam J. Hazlett

Other company changes include the resignation of **Lewis M. Parsons** as a director and member of the executive committee and vice president in charge of sales, and the election of **John W. Reavis,** of Jones, Day, Cockley and Reavis, as a director.

• **Charles L. Saunders,** former vice president of Minneapolis-Honeywell Regulator Co., has resigned as branch chief of the WPB Office of Civilian Requirements, to become vice president of Wheelco Instruments Co., Chicago. Mr. Saunders joined WPB in March, 1942, to organize an instrument branch to correlate manufacturing problems of the instrument industry with war production.

He previously served as sales correspondent and district manager of Brown Instrument in Birmingham, Houston, Pittsburgh and Chicago. With acquisition of the Brown company by Minneapolis-Honeywell in 1935, he was appointed Chicago regional sales manager, and two years later became resident vice president of the company.

Wheelco Instruments Co., manufactures industrial indicating, recording and control instruments.

• **Dresser Manufacturing Co.** will call a meeting of stockholders on October 16, preparatory to acquiring the assets of International-Stacey Corp., Columbus, O., **H. N. Mallon,** president, said August 16.

Authorization will be sought to increase the shares of common stock from 350,000 to 600,000, to fix a $1 par value on all shares and to change the company's name to Dresser Industries, Inc.

"Through acquisition of the property and business of International-Stacey," Mallon said, "Dresser Industries for the first time will become a major supplier of equipment used in drilling for, and producing, oil and gas."

The various companies in the Dresser group manufacture engines and compressors, pumps, couplings and other equipment for producing refining and transporting oil. International-Stacey and its subsidiaries are makers of derricks, drilling equipment, blowers and other oil and gas field products.

• **Rheem Manufacturing Co.,** largest manufacturer of automatic water heaters, in August acquired the business of Stokermatic Co. of Salt Lake City, a pioneer manufacturer of automatic coal stokers and stoker-fired water heaters and basement furnaces. Rheem will manufacture and distribute Stokermatic products on a world-wide basis, stated **R. S. Rheem.**

The Stokermatic patents will permit the company to add a coal-burning automatic water heater to its present line of gas, electric and oil heaters, putting the company in position to meet postwar demands for automatic water heaters using any type of fuel, and to manufacture them in any of its 15 plants. Stokermatic is now confining its output to valves, high pressure fittings and other products for the armed services and the Maritime Commission.

Other Rheem peacetime products include floor furnaces, boilers, tanks, and steel shipping containers.

• **Colonel Willard F. Rockwell,** president of the Pittsburgh Equitable Meter Co.-Merco Nordstrom Valve Co., has announced the appointment of **A. J. Kerr** to the position of general sales manager for the combined organizations.

A. J. Kerr

A graduate of Carnegie Institute of Technology with a B. S. in mechanical engineering, Kerr was appointed district manager of the Equitable Meter Co.'s Tulsa office in 1925, prior to the merger of the Pittsburgh Meter Co. and the Equitable Meter Co. in 1926.

He is a member of the American Society of Mechanical Engineers, and was recently appointed to serve as manager of the society for a 3-year term.

His first official act as sales manager was to appoint **M. D. Gilbert** as district manager of the Tulsa office, **C. K. Madison** as district manager of the Houston, Texas, office and **W. S. Andrews** as district manager of the Pittsburgh, Pa., office of the company.

• **Gilbert Schade** has recently been appointed to the staff of the advertising and sales promotion department of Servel, Inc., Evansville, Ind., according to **R. J. Canniff,** advertising and sales promotion manager.

Schade, who was employed by the Pratt & Whitney Division of United Aircraft, served five years as sales promotion manager with the Silex Coffeemaker Co. He was also with the John B. Fairbairn agency of Hartford, and for two and one-half years was on the sales promotion staff for the Hartford Steel Ball Co.

• The appointment of **W. S. W. McCarter** as Director of Research and Development of the Attapulgus Clay Co. and the Porocel Corp., both of Philadelphia, was announced recently. He is a graduate of Pennsylvania State College and has been research supervisor of the companies for the past four years.

• **W. E. Haase** has been appointed sales promotion manager for L. J. Mueller Furnace Co., Milwaukee. Haase will concentrate, in his newly created position, on postwar potentialties.

• **General Controls, Glendale, Calif.,** manufacturers of automatic pressure, temperature and flow controls, has installed its New York factory branch in new and larger quarters in the Architects Building, 101 Park Ave., New York City. According to Branch Manager **John Hammond,** two reasons prompted the move: (1) Increasing demands for General Control's products; (2) Better service to customers.

John Hammond

Hammond has had nine years' experience in the controls business on the Atlantic seaboard as salesman, sales engineer, and branch manager. At war's start, he took an active part in General Control's Co.'s pioneer work in the application of big automatic shut-off valves to aircraft uses.

In line with General Controls' expansion program, the Cleveland Branch also moved into new quarters recently at 3224 Euclid Ave., Cleveland, Ohio, with Branch Manager L. E. ("Rusty") Wetzell in charge.

Donald D. Couch

• On Thursday, July 27, the board of directors of the American Radiator & Standard Sanitary Corp., at a meeting held in New York, elected **Donald D. Couch,** vice president and general manager of sales, effective immediately. Mr. Couch's headquarters are in the general offices of the corporation, Bessemer Building, Pittsburgh, Pa.

Obituaries

• **J. Simon Fluor,** 78, founder and president of Fluor Corp., Ltd., designers, engineers and constructors, Los Angeles, died July 29 at his home in Santa Ana, Calif. Mr. Fluor, a native of Switzerland, started in the construction business in Wisconsin, and in 1912 came to California to enter other fields. The construction of his first cooling tower in 1920 saw the beginning of a firm which today manufactures air-cooled mufflers (an invention of Mr. Fuor's) for pipeline pumping stations and other internal combustion power plants, and is engaged in designing, engineering and constructing plants for oil, gas and allied industries. The company is now managed by three sons: **P. E. Fluor,** president; **J. S. Fluor,** executive vice president and general manager, and **Fred C. Fluor,** director and supervisor of equipment.

• **Daniel C. Green,** 59, public utilities consultant and chief executive of Cleveland Pneumatic Tool Co., and one-time reorganizer of the Samuel Insull utilities empire, died at Petoskey, Mich., of undulant fever.

Mr. Green had operated gas, electric and street railway companies, and in 1933, after resigning as vice president of Electric Bond & Share Co., N. Y., became court-appointed trustee for the Insull Empire-Middle West Utilities Co. He put the utility network in order in 14 months, reorganized it as the Middle West Corp., and served as president until 1937.

• **John A. Little,** comptroller, Welsbach Engineering and Management Corp., Philadelphia, died at his home July 27, after a prolonged illness. He was 54 years old.

Mr. Little joined the Welsbach organization as an office boy in 1906, and except for nearly two years' service in the army during the First World War, including active service in France, his employment was uninterrupted with the Welsbach Engineering and Management Corp., and its subsidiaries, Kitson Co., Ozone Processes, Inc., and Welsbach Street Lighting Co.

• **William G. Walshe,** 63, head of the home heating department of Elizabethtown Consolidated Gas Co., Elizabeth, N. J., died July 1 at his home after an illness of five weeks. Mr. Walshe had been employed by the company for 10 years.

• **Otto H. Best,** Springfield gas meter superintendent for Central Illinois Light Co., Peoria, Ill., died July 31st after a short illness. Mr. Best started in the Springfield meter shop in 1903 and had been continuously with the company since that time.

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You get Results with CARBOSEAL anti-leak

A 1,700-foot section of a 4-in. main with cement joints carrying dry manufactured gas showed a leakage of 114 cu. ft. per hour before treatment. After treatment with Carboseal anti-leak, the leakage was cut to 10 cu. ft. per hour, a reduction of approximately 91 per cent.

This is one example of the results obtained in more than 6,500 *miles* of gas mains treated with Carboseal.

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CURRENT READING

A Method of Evaluating Pressure Maintenance—N. van Wingen, senior production engineer Richfield Oil Corp., Los Angeles. This report describes one possible method of determining the economics of pressure control and maintenance operations as applied to a deep, high-pressure reservoir having a low gas-oil ratio. The results of the analysis indicate that a premise of increased recovery need not be predicted to justify economically such methods of operation. The entire problem of determining the feasibility of pressure-maintenance operations is thus resolved into a consideration of the following: (1) a determination of increased recoveries, resulting from pressure control and maintenance as against deferred sales for the gas, including a consideration of the economic feasibility of purchasing gas for injection purposes; (2) an investigation of the extent to which it will be possible to control the expansion of the secondary gas cap so that no appreciable by-passing of the cycled gas will result.

Rotation-Type Gas-Lift System—E. H. Short, Jr. "Oil and Gas Journal" May 18, 1944, pp. 67, 68. In the "Oil and Gas Journal," January 17, 1944 issue, p. 49, a method of gas lift employed to produce deep Gulf Coast wells and involving the use of high-pressure gas, available either from the same lease or from other sources, was described. This article concerns another method being adopted in a number of Gulf Coast fields where high-pressure gas is not available. This method, designated as the "rotation" system, makes use of a small compressor and alternate operation of wells.

An Analysis of Error Due to Pulsation in the Measurement of Compressible Flow with Flow Meters—E. J. Lindahl, assistant professor of mechanical engineering, Ohio State University. It is not the purpose of this paper to deal with all sources of pulsation or to suggest any method for the elimination of pulsation. Its only purpose is to show in a theoretical way, how pulsation acts to give erroneous readings on a flow meter. The mathematical analysis is broken down into barest fundamentals.

Hydrocarbon Gases—Specific Heats and Power Requirements for Compression—E. G. Scheibel ad D. F. Othmer. "Ind. and Engr. Chem.," June, 1944, pp. 580-583. Nomographs and methods of calculation are presented for determining the ratio of the specific heats of hydrocarbon gases, the final temperature attained in a compression or expansion, and the theoretical horsepower requirements for compression. These mathematical methods depend on correlations of the physical properties of hydrocarbons, offer a considerable simplification of the calculations which are rather tedious otherwise, and may be used within the limits of accuracy required for engineering design.

Postwar Employment and the Liquidation of War Production—A Statement on National Policy by the Research Committee of the Committee for Economic Development. This pamphlet constitutes a brief summary of conclusions contained in the research report of Dr. A. D. H. Kaplan, Professor of Economics, University of Denver, who worked under the auspices of the CED, and an expression of the views of the CED's Research Committiee.

The primary problems facing the country, according to the report, are the speed that will be necessary in postwar reconversion of industry, the need for sustained and rapid expansion of national production—not just a return to pre-war production—and, above all, unity of purpose and action by all groups in the national life. Factors considered in detail are the billions of dollars involved in the cancellation of many uncompleted prime and sub war contracts; the disposal of surplus materiel, including contractors' inventories; and the disposition of war plant and equipment under private operation and competitive conditions.

Paloma Gas Condensate and Cycling Plant Near Completion—I. B. Funk. "Petroleum World," June, 1944, pp. 46-49. Pacific Coast oil men are now watching with increasing interest the development of California's first condensate field, Paloma, which, under a unit plan of operation directed by Western Gulf Oil Co., is rapidly crystallizing the dreams of process engineers and designers into an effective industrial plant of extreme significance in the present war effort, and of equal importance in the postwar scheme. The gas condensate and cycling plant consists of a 3600-hp. compressor, installation and an absorption and stripping plant, capable of handling approximately 57,000 mcf. of wet gas per day, with anticipated daily recoveries as follows: Stabilized condensate, 5700 bbls.; Stabilized natural gasoline, 800 bbls.; total butane fraction (one-third isobutane), 1200 bls. Plant is described and illustrated.

Corrosion of High-Pressure Gas Production Equipment—T. S. Bacon. "Oil Weekly," June 19, 1944, pp. 34, etc. The problem of corrosion of high-pressure production equipment is a very real problem insofar as the petroleum industry is concerned. Information regarding the exact causes of this corrosion is not presently known. No generally satisfactory methods of combating this corrosion have been proven. The problem can best be attacked by the cooperative efforts of the petroleum industry.

American Contribution to Gas Turbine Development—C. C. Jordan. "Power," June, 1944, pp. 76, 77. Part 1. Some Houdry units have operated continuously from six months to two years with no maintenance problems that would not be expected of steam turbines. Future development depends on solutions to certain design problems.

Desulfurization of Gas in the McKamie Field, Arkansas—F. H. Love. "Petroleum Engineer," June, 1944, pp. 55-58. Sour gas is made into usable fuel and liquid hydrocarbons are recovered in commercial quantities in the plant of the McKamie Gas Cleaning Co. Described and illustrated. A flow sheet of the plant is shown.

The Mettler "FAN-AIR" Gas Burner

A Modern Complete Gas Burner System

"Fan-Air" is a mechanical draft fully automatic gas burner system—ideal for difficult jobs and can be used under natural draft operation also. Nothing else like it. Sizes 5 to 300 B.H.P. **Immediate Delivery.**

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TRENDS and COMMENT

By ARTHUR ROHMAN

The "Excess Profits" Tax Front

The cross-country rash of utility "excess profit" rate investigations continues to spread.

Michigan: The nearest thing to a decision in a case of this type was handed down last month when the Michigan commission directed Detroit Edison to rebate $10,450,000 to its customers for the year 1944. The redistribution plan must be submitted by September 15 with users being repaid by December 31. Other Michigan utilities have orders to file by September 15 reports on six months gross income. As much as $30,000,000, once set aside for Federal taxes, can be returned to consumers. The commission's action presupposes that the municipal tax case (the City of Detroit seeks to impose a 20% municipal tax on utility gross revenue), which is still in litigation, is invalid. Thus, the taxpayer wins the $30,000,000 over the other two contestants, the Federal government and the city of Detroit, even though it would appear that the purse is granted before the winner has flashed across the finish line.

California: Afer hearings in San Francisco on August 10 and in Los Angeles on August 18, the case of the 130 utilities, which have been asked to show cause why their rates should not be reduced to eliminate the so-called "war taxes" paid the Federal government, will continue with hearings in San Francisco, September 11 and 12.

The California investigations actually consisted of two cases: (1) Southern Counties Gas Co. rate hearings to determine whether or not that company's rates should be reduced; (2) a general investigation of all public utility rates in the state.

Hearings on the Southern Counties case were concluded on August 22 with the decision that no determination will be made until the general hearings are completed. Southern Counties was given 15 days following completion of the general hearings to file a brief setting forth its case against a rate cut.

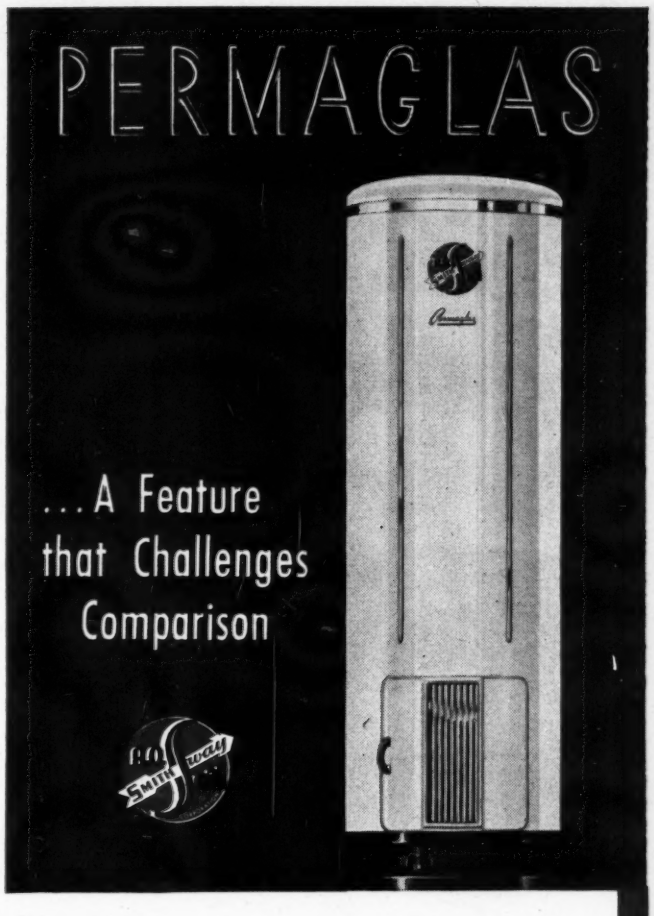
A new light has been put on the California case with the statement by Commission President Richard Sachse, a sponsor of the proposal, that the investigation is merely "exploratory." All the commission wants are a few facts so that it can formulate policy on how the utilities and their rate payers are affected.

Furthermore, according to Commissioner Frank Clark, a co-sponsor, the hearing is not a step to cripple utilities by arbitrary rate reductions. "On the contrary," states Clark, speaking for himself, "I would be willing to grant them rate increases, if it is necessary to do so."

At least two of California's larger utilities must have been glad to hear this, since their testimony at the San Francisco hearing revealed that earnings are presently lower than they had been prewar.

Pacific Telephone and Telegraph representatives disclosed that average ratio of earnings for the war years to date is 5.72% for total California operations, as compared with an average of 6.82% for the 12 pre-war years, 6.59% for the four mid-thirty depression years and 7.22% for the four "base period" years recognized in federal revenue laws imposing wartime taxes.

Stated Pacific Gas and Electric Co.: "After taxes, the company's earnings available for the payment of common stock dividends in the past two years were lower than in any other year since the depression years, 1932-35. In



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Write for further information and get the inside story on SMITHway Automatic Gas Water Heaters lined with *Permaglas*.

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Permaglas Victory Model Heaters are available in all sizes in accordance with W.P.B. limitation order L-185.

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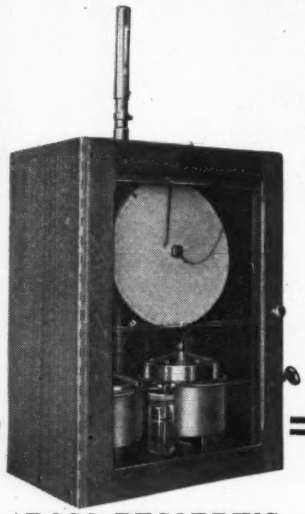

ARCCO RECORDING GAS GRAVITOMETER

eliminates computations

Once calibrated and properly installed, the Arcco-Anubis Gas Gravitometer requires no further attention. Hundreds are in use in the pipelines and refineries of major companies.

This precision specific gravity instrument is constructed without electric motors, pressure regulating valves or other complex arrangements. It weighs the gas sample directly—hence the record is read directly to the second decimal place, and by easy approximation to the third decimal.

The instrument is practically frictionless and the gas flows through it continuously, thus minute changes in specific gravity are recorded at once as they occur. As shown through years of use, Arcco-Anubis Gas Gravitometers remain accurate and highly responsive under even severe conditions of service.

Send for Bulletin No. 101

AMERICAN

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1943, because of increased operating expenses and taxes, the company earned $2,000,000 less on its common stock than in the average prewar years from 1935 to 1939."

To the charge which proponents of the rate readjustment proposal have made that utilities are passing war taxes on to the consumer, the Pacific Gas and Electric statement pointed out that this would have been possible only if rates had been increased. In its case, the contrary is true. Rates are now lower than ever before.

Thomas Turleau, of New York, tax attorney, took the stand as an expert witness on the character and purpose of war taxes. Turleau in 1937 and 1938 was legal assistant to the Under-Secretary of the Treasury and from 1938 to 1942 was legislative counsel to Secretary of the Treasury Henry Morgenthau. He explained that the so-called excess profits taxes are misunderstood. They are in no way intended to regulate the percentage of profit a corporation can make. Rather, their sole objective is to produce revenue with which to finance the war on the basis that the government has a right to regain some of the extra earnings which may accrue as a result of its war spending.

To sum up, the situation in California seems to be this: the Federal government needs the tax money; the utilities are not presently getting fat off the war; the utilities need what benefits there are from current high gross incomes for rehabilitation, expansion, and to maintain employment after the war; the waste of time and manpower in the legal proceedings is prodigious; the rate payer doesn't need a refund or a reduced rate, and if he got it, he would likely be asked to repay it to the Federal government to help pay for the war.

And yet three men of a five-man commission (Sachse, Clark and Havenner, all appointees of ex-Governor Olsen) have the power to haul 130 utilities into court during the hour when the European war is drawing to a climax.

Kentucky: Hugh Bearden, consultant for Kentucky Public Service Commission, has been instructed to investigate the possibility of consumer refunds from excess profits of utilities operating in that state. Action is based on an order of Secretary of the Treasury Henry Morgenthau, Jr., that "if the setting of reasonable rates results in the Federal government collecting less excess profits taxes, the Treasury Department is prepared to accept the results." It is estimated that the study will require four months to complete.

Ohio: Cleveland Electric Illuminating Co. has petitioned the Ohio commission for a city ordinance to cut rates about $1,200,000. OPA seeks to intervene in the case, its petition pointing out that the city could properly take into account the company's apparent amenability to Federal excess profits taxes. OPA contends that the charging of "war taxes" to operating expenses conflicts with the government's program to stabilize living costs.

What the outcome of all these investigations will be only time will tell. It is known that some public officials, both State and Federal, desire to cripple the utilities financially, to place them in a position where they will be deserted by private capital. That is the first step toward eventual government ownership.

Ninety radio stations, coast to coast, have used material prepared by the Liquefied Petroleum Gas Association Publicity Committee. Scripts offer helpful information, tie-in the LP-Gas story. A little cooperation and Gas might go along for the ride.

End Use

One of the more important topics discussed in this magazine in recent issues has been the stand of the Federal Power Commission that it has the power to control the operations of utilities to the end that "natural gas resources be conserved in so far as possible for domestic, commercial, and superior industrial uses.". (R. E. Wertz, July, 7; Taylor, Aug., 9; this issue, 9).

Active opposition to this federal control of natural gas was taken by the Independent Natural Gas Association of America when the board of directors meeting on Aug. 1 at Tulsa adopted two resolutions: (1) expressing the opinion that the regulation of the production, gathering, and conservation of natural gas is the "function of the respective producing states and not of any federal agency"; (2) that the Association favors extension of natural gas pipeline facilities which will afford adequate markets for producers, meet expanding demands of consumers with no limitation on industrial use of gas.

The Association recently received permission to intervene in a re-hearing before FPC, scheduled for Sept. 27, in Washington, in the application of the Memphis Natural Gas Co., to expand its pipeline facilities in Tennessee to serve new businesses and industries. Application of Memphis recently was denied on the premise that the available natural gas reserves, insofar as possible, be conserved for "domestic, commercial and superior industrial uses."

Alleging that this holding will se-

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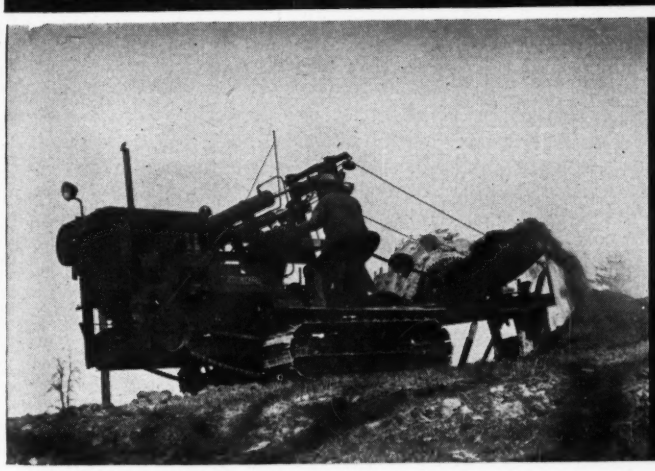

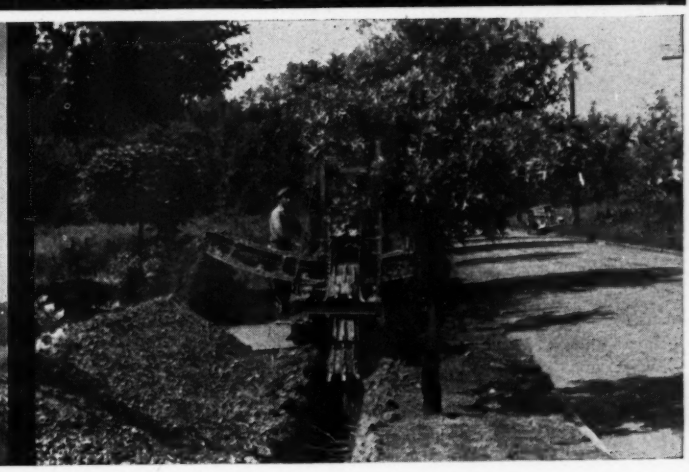

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riously affect the natural gas industry the Association petition requests that, upon rehearing, the Federal Power Commission adhere to its former decision that Congress has not given it comprehensive powers to deal with the "end uses for which natural gas is consumed."

• *More than a half million automatic refrigerators, almost one-third of those in use in New York City, are overage and are operating inefficiently, Consolidated Edison Company of New York stated last month. According to the utility, tests have proved that refrigerators operating faultily have greatly increased the consumption of electricity and resulted in needlessly high bills. Looks like a gas opportunity.*

Three to One

If you are a betting man, put your money on the gas range, for electric ranges get out of order three times as fast as gas ranges. This fact was revealed in an official nationwide survey by the Office of Civilian Requirements, WPB.

The study covers a wartime period during which replacement parts and service facilities for both types of ranges have become progressively scarcer. It is shown that 3% of electric ranges on the lines have gone out of commission while only 1% of the gas ranges have become unusable.

Although 20,305,080 gas ranges are shown to have been in use as compared with 3,542,944 electric ranges, only 203,051 gas models are reported as casualties as against 106,237 electric stoves.

The comparison becomes even more significant when a further study of the survey reveals that a relatively larger portion of the gas ranges covered in the analysis are more than five years old and on that basis might reasonably have been expected to give trouble more quickly than newer models of either type.

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Exceptional opportunity to make a permanent connection with one of the outstanding gas range manufacturers of the country. Must be thoroughly trained and experienced in motion analysis, work simplification and setting standards for piece work purposes. Work consists of sheet metal, enameling, and assembly of ranges—fabrication, heat treating and assemble of aluminum parts for aircraft.

Write Personnel Department, Cribben and Sexton Company, 700 North Sacramento Blvd., Chicago 12, Illinois.

The government survey also shows that the gas industry made good progress in recent prewar years in replacing older or obsolete models with modern gas ranges. Of the 20,305,080 gas ranges listed in the compilation, 32.3% were shown to be five years old or less.

In addition to gas ranges, appliances registering only 1% casualties included gas and electric water heaters, with 9,492,416 of the former in use as against 1,203,264 of the latter. Gas heating stoves were also in the 1% class.

Appliance Production

The Plumbing and Heating Division of the WPB has released some figures on the production of domestic, nonelectric cooking and heating appliances.

In March of 1944 production of gas cooking appliances totaled 64,709 (ranges, 60,863; hot plates, 3846), setting a new high over the January, 1944 mark of 46,919. These figures compare with monthly production averages of 28,600 during 1943; 149,686 for May-December, 1942; 381,960 for July, 1940 to June, 1941.

Gas heating stove production during the past 15 months reached its production high in November, 1943, with 57,947 units. While production during the first three months of 1944 has tapered off to a monthly average of almost 44,000, this figure is more than twice the monthly average for the first three months of 1943.

Since production figures for cooking and heating appliances using competitive fuels are in most cases also on the uptrend, it would appear that to all practical purposes many manufacturers are in position to take speedy advantage of WPB Chairman Nelson's Aug. 15th ruling, which will permit manufacture of civilian type products, provided such activities do not interfere with the war effort.

Public Ownership

The British utilities, too, are continuing to have their public ownership troubles. Recently the national executive committee of the labor party presented the following proposal to the party conference.

"The Ministry of Fuel and Power should, it is proposed, be responsible for the general supervision of productive activities in coal, gas, electricity, by-products, etc., and the Minister should appoint a national coal and power corporation to own and supervise the administration of all the industries concerned."

AWARDS

• The National Security Award of the United States Office of Civilian Defense was presented to **Atlanta (Ga.) Gas Light Co.** at a gathering of employees and their families, at the Gas Company Service building on June 29. The utility was the first Atlanta concern designated to receive the award.

Jerome A. Connor, regional director of the Office of Civilian Defense, presented the award to H. Carl Wolf, president. In accepting the award, Wolf pointed out that with the lighting of 50 gas street lamps in Atlanta on Christmas Day, 1855, the Atlanta Gas Light Co. started a service to the community that has suffered only one interruption in the better part of a Century that has passed—and that was following the Battle of Atlanta when Atlanta was burned and the gas plant itself destroyed.

• The Lattimer-Stevens Co., Columbus, Ohio, has received its second Army-Navy "E" award for "meritorious services on the production front." Lattimer-Stevens, whose peace-time products are gas meter bars and stopcocks, are at present making component parts for ammunition.

• The Peoples Gas Light & Coke Co., Chicago, Ill., received the National Security Award from the U. S. Office of Civilian Defense in recognition of its excellent standards of emergency protection and its contribution to civilian defense in support of the war effort.

• The **W. J. Schoenberger Co.**, Cleveland, O., has received an Army-Navy "E" award for outstanding production. This presentation, the fourth in two years, entitles the company to permanent possession of the pennant.

• **The Estate Stove Co.**, Hamilton, Ohio, has received for a second time the Army-Navy production award for "meritorious services on the porduction front." The renewal is a white star to be added to the Army-Navy "E" pennant originally presented to the company.

Lone Star Celebrates 35th Anniversary

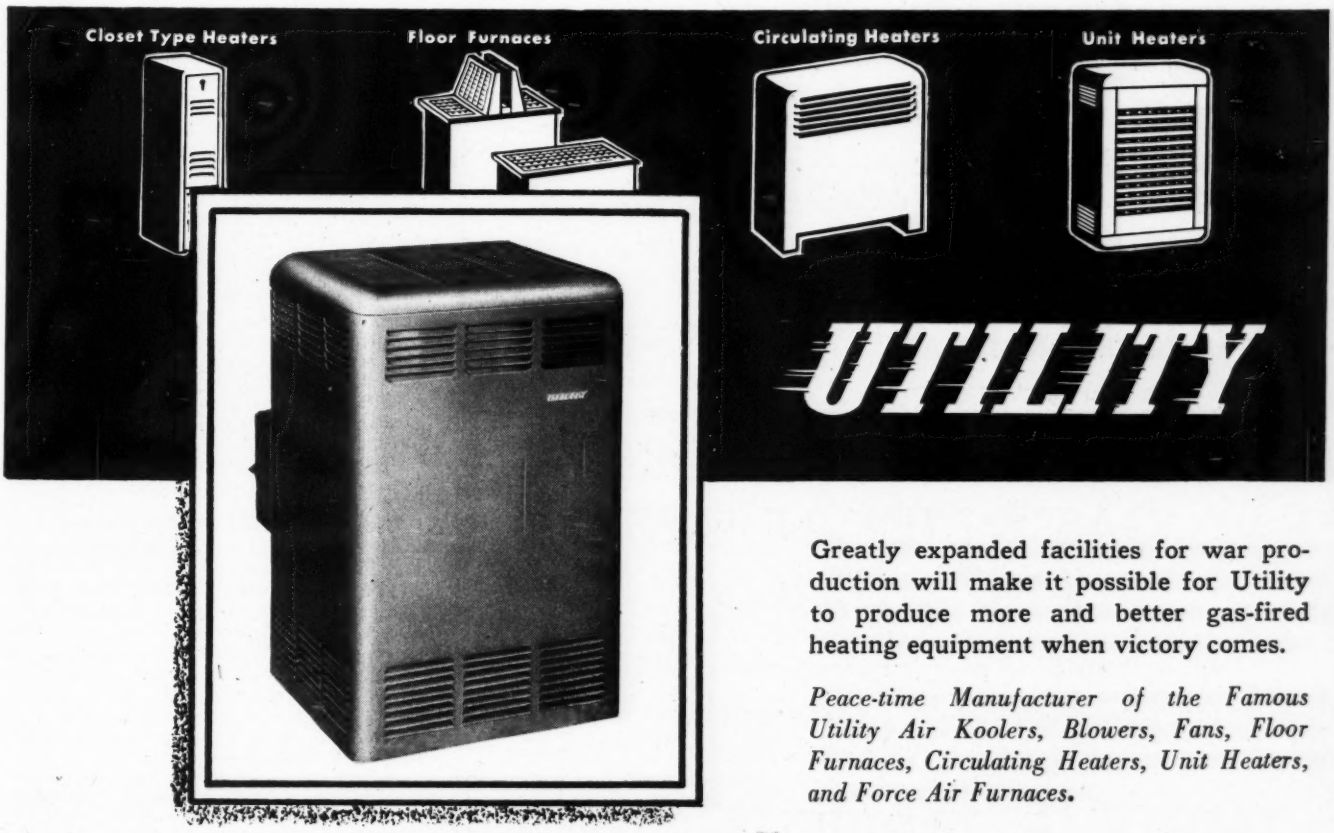
Lone Star Gas Co., Dallas, Tex., organized June 1, 1909, this year celebrated its 35th anniversary. The company constructed the first line to carry natural gas over long distances in Texas —a 135-mile line bringing the fuel from Petrolia to Ft. Worth and Dallas, serving about 15,000 consumers.

Since its foundation, it has grown to more than 5000 miles of main lines carrying gas from 1200 wells located in 75 fields and serving more than 325,000 customers. Lone Star is responsible for the fuel requirements of more than a million and a half people residing in central and northeast Texas and southern Oklahoma.

Engines on Stilts Protect Houston Natural Line

Serving approximately half of the city of Houston, Texas, with natural gas, the Houston Pipe Line Co. has a pipe line running through the frequently flooded, sea-level salt marshes near Freeport. Acting as an electrolyte, the flood water causes the ground to act as a huge storage battery which subjects these marsh pipelines to considerable deterioration from electrolysis.

Through the use of Buda engines, Models HP-205 and HP-217, which are operated constantly, the deteriorating effect of this ground current is controlled and made to flow in the proper direction. A group of twelve of these machines have been operating for more than seven years with the original equipment.



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PIPELINE NEWS

• As the result of an expected delivery before the end of the year of 100,000,000 cu. ft. of gas daily, **Hope Natural Gas Co.**, Clarksburg, W. Va., has been granted permission by FPC to proceed with two major projects to expedite distribution of the gas.

The new supply will come into Cornwell Station, W. Va., at the southern end of the pipe system, which at present has 7000 hp. of steam-driven gas compressors installed. Work will consist of the addition of another 1000-hp. and the complete rebuilding of the piping system to add a fourth stage to the present three-stage layout.

Going north from Cornwell are two main discharge lines, a 20-in. line, designed for 350 lb., built in 1925; and a 12¾-in. line, ⅜-in. thick, designed for 1350 lb. built in 1936, and 95 miles long where it discharges into the 300-lb. discharge system at Hastings, W. Va. So far this 12¾-in. line has been operated at about 1000 lb. pressure, with a capacity of 75,000,000 cu. ft. daily, but with the new installation and repiping, the pressure will be raised to the design pressure of 1350 lb., giving a capacity of 100,000,000 cu. ft. daily.

There is also being added a new glycol dehydration plant to dry up the gas in the 20-in., and changes in the present dehydration plant on the 12¾-in., which will reduce the water content of the gas in this line to 2.5 lb. of water per 1,000,000 cu. ft.

Hope consequently will be able to supply added markets, and plans to lay a line into northern Pennsylvania to alleviate the serious shortage there and in the New York State areas. The company and its associate, the **New York State Natural Gas Co.**, are laying a 12¾-in. O. D. pipeline, 145 miles long from Hastings, W. Va. to Clarion County, Pa., designed for 1300 lb. pressure, with a thickness of only 9/32-in. Specification of the steel called for 48,000 lb. yield point and 70,000 lb. ultimate strength. Since soil in this country is nearly neutral, and the life of bare pipe is about 40 to 50 years, only 15 miles of line is to be coated and wrapped, the remainder being bare, except for a mill coat of enamel.

Hope is also installing at Hastings 4000 hp. of additional steam-driven compressors to pump gas through the new line, and a new boiler to operate on powdered coal or gas, though it is expected that due to its location in a high-grade coal field, operation will be entirely on coal. This will bring the installed horsepower at Hastings up to 33,000 hp., making it the largest station in the industry.

All additions are expected to be completed by Nov. 1, so that shortages which existed last winter will be relieved before the arrival of extremely cold weather.

• **Cities Service Gas Co.**, Bartlesville, Okla., has received permission from FPC to install new facilities which will increase daily capacity of the 231-mile Hugoton line in Oklahoma from 140,000,000 cu. ft. to 213,000,000.

The commission also authorized the company to operate the recently constructed $9,000,000 Hugoton line until June 30, 1945, under lease from Cities Service Transportation & Chemical Co., Ponca City, Okla., which laid the pipe.

Approval was given for the Ponca City company's proposed financing to become effective, subject to the condition that the company shall not pay its parent—Empire Gas & Fuel Co.—any interest in excess of the actual cost to Empire for obtaining funds advanced to the subsidiary company.

The facilities include short pipe lines to collect gas from 37 new natural-gas wells which will be drilled in the Hugoton field, and carry it to the main pipeline.

The line, put in operation this year, extends from the Hugoton gas field in Texas County to the gas company's Blackwell station in Kay County, Okla.

• To augment the supply of natural gas for the San Francisco Bay region and neighboring coastal territory, thereby releasing more oil for America's war forces in the Pacific, **Pacific Gas & Electric Co.**, San Francisco, is constructing extensive additions to the system of transmission pipelines that deliver gas from the Rio Vista field in Solano and Sacramento Counties.

The project will cost $2,000,000 and will increase the capacity of the facilities more than 75 million cu. ft. a day.

Nearly 50 miles of new pipelines are being laid—9½ miles of 10-in. and 12-in. main between the Rio Vista field and the Antioch metering and pressure control station; 25½ miles of 24-in. main between Antioch and the Irvington control station; 11 miles of 24-in. main between the Milpitas terminal to a point southeast of Palo Alto, where the new line will join one of the existing mains running to San Francisco.

• **The New York State Natural Gas Corp.**, New York, N. Y., has applied to FPC for authority to purchase from the Peoples Natural Gas Co. an 89-mile pipeline located in Pennsylvania, and a private telephone line paralleling the pipeline. The purchase price the company proposes to pay is $815,256.77. The 12-in. pipeline extends from a point in Clarion county to an interconnection with the applicant's 10-in. line in Potter county, Pa.

• **Southern Natural Gas Co.**, Birmingham, Ala., has applied to FPC for authority to construct and operate:

1. Facilities which include loop lines varying in diameter from 10 to 22 in. and in length from 687 ft. to about 27 miles, in Perry, Dallas and Jefferson

WANTED

Exceptional opportunity for permanent position with Cribben and Sexton Company, one of the major gas range manufacturers. Must be experienced in gas range design and product development. Must have the ability to coordinate design problems, performance requirements, with field problems and production operation. Must be graduate engineer. Give complete details as to qualifications, age, experience, education.

Apply Personnel Department, Cribben and Sexton Company, 700 North Sacramento Boulevard, Chicago 12, Illinois.

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Counties, Alabama, Issaquena County, Mississippi, and Fulton and Bibb Counties, Georgia; lines, heaters and meters in the Logansport, La., gas field, and

2. About 5 miles of 4-in. line near Spaulding, Jefferson County, Ala.; seven air-cooled mufflers on seven 1300-h. p. gas compressors at the Perryville La., compressor station, and two gas scrubbers at the Logansport dehydration plant.

• A pipeline to eliminate the hazards of surface transportation of petroleum to Allied troops is being constructed by U. S. Army engineers in the China-Burma-India sector, according to an announcement by the War Department. Though no information was given as to the route of the line, its length or the identity of the men involved, it was revealed that the work has been going on for months and is making satisfactory progress. The line is a result of intense and repeated surveys by Army engineers and American business men.

• **Michigan Consolidated Gas Co.** has received permission from Michigan Public Service Commission to construct a natural gas pipeline between Greenville and Belding, Mich., with the project to be completed by the end of this year.

• **United Gas Pipe Line Co.,** Shreveport, La., has applied for a War Department permit to lay 10-in. pipelines on the bottom of the Mobile River, 12 miles northeast of Mobile, Ala., the lines to form part of a new 8-mile loop the company is building on its Pensacola main line.

WANTED

An ambitious man, experienced in use of LP Gas, to manage company.

Company converting water gas plant to Propane in Middle West county seat town of 5000 in good agricultural section is looking for a man experienced in handling central station system with mains over entire town as well as servicing and selling appliances on the system and bottle customers. Prefer college educated man between 30 and 50, but appearance, ability and experience will count for book learning. Will start right man at $200.00 or more a month with per cent of gross or net of total company business also commission on sale of appliances. Essential Industry and if you qualify we will assist in WMC release. Write Box 174, Kansas City, Kansas, giving education, experience, references and picture of yourself.

WANTED

PRODUCT DEVELOPMENT ENGINEER

JAMES GRAHAM MFG. CO., one of the major Pacific Coast gas range manufacturers, desires to obtain for a permanent position, a graduate engineer having the following capabilities:

- ***Experience in gas range design and combustion practices.**
- ***Familiarity with AGA testing procedures.**
- ***Knowledge of production operation and development.**

Give complete details as to personal qualifications, age, experience, education, etc.

Apply Personnel Department

JAMES GRAHAM MFG. CO.
Newark, California

• **Cincinnati Gas Transportation Co., United Fuel Gas Co.,** and **Warfield Natural Gas Co.,** subsidiaries of **Columbia Gas & Electric Corp.,** with principal offices in Charleston, W. Va., have applied to FPC for authority to construct the following:

1. Cincinnati Gas Transportation Co. seeks an 8-in. pipeline, 400 ft. long, with measuring station and facilities at Leach, Ky., to permit delivery of natural gas from the Tennessee Gas & Transmission Co. 2. Warfield Natural Gas Co. desires two 10-in. pipelines, measuring station and facilities near Burnaugh, Ky., one line to extend 1350 ft. from the Tennessee Gas and Transmission Co.'s line west to connect with Warfield's existing line, and the other to extend 2034 ft. east to connect on the west side of the Big Sandy River with a 10-in. line the United Fuel Gas Co. proposes to construct. 3. United Fuel Gas Co. seeks (a) a 10-in. pipeline, 1995 ft. long, extending from an interconnection with Warfield's proposed line east across the Big Sandy River to an existing 20-in. line owned by United, (b) a 12-in. pipeline, 450 ft. long, at Cincinnati Gas Transportation Co.'s Kenova compressor station, to transport natural gas to be received from Tennessee Gas and Transmission Co. to United's line and thence to the Ohio Fuel Gas Co., with facilities including a 20-in. gas mixing chamber, and (c) a pipeline of 32,800 ft. of 12-in. and 4000 ft. of 16-in. pipe, from a point on the Tennessee Gas and Transmission Co.'s 20-in. line, in Kanawha County, W. Va., north to United Fuel Gas Co.'s Lewis compressor station in Roane County, W. Va., with measuring station structure and equipment.

• Construction of **Tennessee Gas & Transmission Co.'s** 24-in. trunk line from Corpus Christi, Tex., to West Virginia is 50% complete with 639.8 miles of pipe now laid, and work reported progressing at the rate of 13½ miles per day. An average of 10 miles per day is being maintained by the 23 spreads engaged in the job.

Station 6, Monroe, La., and No. 8, Batesville, Miss., were 85% completed, and other stations 35 to 70% completed on July 24.

With the exception of 15 steel buildings and certain consignments of station piping and valves, all major items of equipment, including compressors and pipe, have been delivered.

Swinerton & Walberg Co. has moved to a section extending 30 miles west from the Tennessee River.

J. R. Horrigan Construction Co. has finished 47 miles of the line in West Virginia, and on July 19 moved one spread to Tennessee and another to a section in Kentucky, starting at the Big Sandy River. The 20-mile section near the dehydration plant has been tested with 800 lb. air pressure. The line is designed for operating pressures of 750 lb.

• **Kansas-Nebraska Natural Gas Co., Inc.,** Phillipsburg, Kans., has applied to FPC for authority to construct and operate (1) 16 miles of 12¾-in. pipeline extending north from its compressor station near Stockton in Rooks County, Kans., along the route of the company's existing 6⅝-in. line, and (2) to remove and abandon the latter line.

Office of War Utilities Ammends U-7 Order

THE Office of War Utilities, WPB, on August 4 amended Utilities U-7, allowing greater latitude in making gas deliveries under the order. Main purposes of the amendment are:

(1) To reduce the number of non-residential consumers in whose behalf interruptible gas purchase contracts are given a firm status. Exhibit A has been revoked and consumers exempted from curtailments pursuant to the provisions of paragraph (c) (1) will henceforth include only those selected by the War Production Board, after consultation with the Army and Navy, as vitally essential to the war program. In times of gas shortage consumers will be curtailed more nearly in accordance with their contractual rights.

(2) To relax certain space heating restrictions in areas where the available supply of gas has improved. In such areas formerly included in Exhibit B but now listed on Exhibit C, changes in paragraph (e) will permit the delivery of gas for the operation of space heating equipment in new housing or in residential premises where non-gas space heating equipment is worn out or unavoidably damaged beyond repair.

(3) To include in pragraphs (d) and (e) of the Order the exemptions from the restrictions on new deliveries which have heretofore appeared in Administrative Letters 3 and 4. Those letters are now superseded by the amended Order U-7 and this letter.

(4) To simplify the method of handling applications for new deliveries of gas in order to reduce the amount of clerical work.

Exhibit B includes areas with a generally unimproved gas supply; Exhibit C areas where the supply situation has improved, due to decline of war demands. All administrative letters under U-7 are revoked except Letter 1-A (formerly Administrative Letter 15 under L-31).

Food Service Equipment Magazine Expanded

"Cooking for Profit," the magazine distributed by gas companies to many of their food service equipment customers, is being expanded to include two new sections—one, devoted to commercial baking with gas, the other to feature the use of gas for commercial cooking and baking sanitation, with special emphasis on hot water and steam generation. Announcement was made by Fenton Kelsey, Jr., Madison, Wis., publisher.

WPB Publishes Food Book

The Conservation Division of WPB has released a revised and simplified "Manual for War-Time Food Storage, Preparation and Serving Facilities," directed toward cafeteria and restaurant owners, manufacturers of food storage, preparation and serving equipment and those in charge of war plants, schools, hotels, military installations, etc.

Testing Requirements

Gas ranges must comply in detail with over 558 requirements; water heaters, 230; central heating gas appliances, 387; and gas space heaters, 270—to be approved at the AGA Testing Laboratories. A similar number of requirements are specified in the standards for other appliances.